PUBLIC WORKS

city county and state

July 1950

Municipal Costs—
A Ten-Year Comparison

Small Water Supplies:
Part II—Sources

A Municipal Plan
For A Small City

Maintenance Program
For Highway Equipment

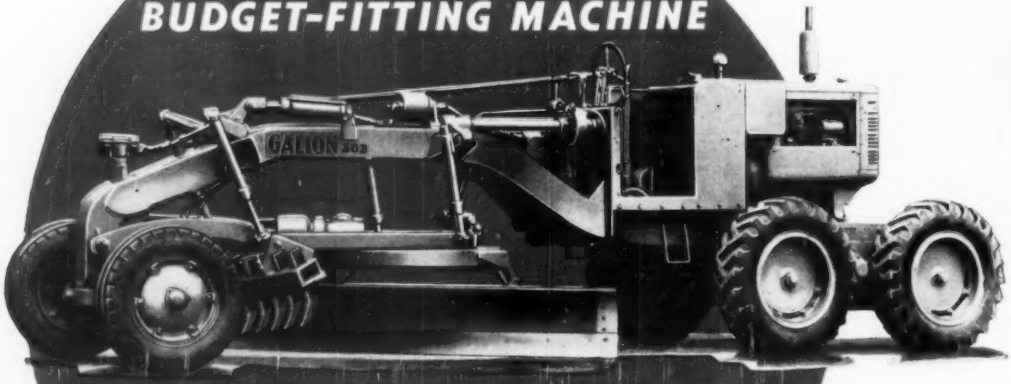
Flood Control
In Battle Creek

Sewer Construction In
Difficult Ground

Harold S. Hutton is General Sales Manager of Wallace & Tiernan Co. He was graduated from Columbia University in 1916, with the degree of BE, with a sanitary option. He entered the Public Health Service and for a year served in the Leavenworth, Kansas, area, before entering the army for the duration of World War I. After the war, he resigned his commission as 1st Lt., Corps of Engineers, and re-entered the Public Health Service, later resigning to take a position with Wallace & Tiernan. Among his many responsibilities with W & T has been that of selecting the field personnel and in carrying out this work he has had close contact with engineering schools and with engineers. He is a member of the American Society of Civil Engineers, a fellow of the American Public Health Association, member of various other engineering societies and one of the fine gentlemen of the sanitary engineering profession.

GALION *Model* 303 MOTOR GRADER

A MEDIUM-DUTY BUDGET-FITTING MACHINE



Is money or performance more important to you?

If the purse is the controlling factor in your motor grader needs, the Galion 303 can be supplied with less costly single drive, manual steering, and 7.00-20 front tires.

But if you want highest possible performance out of an economical 45 h.p. grader, the Galion 303 can be supplied with 4 wheel tandem drive, hydraulic booster steering, and 10.00-24 front tires. Write for literature.

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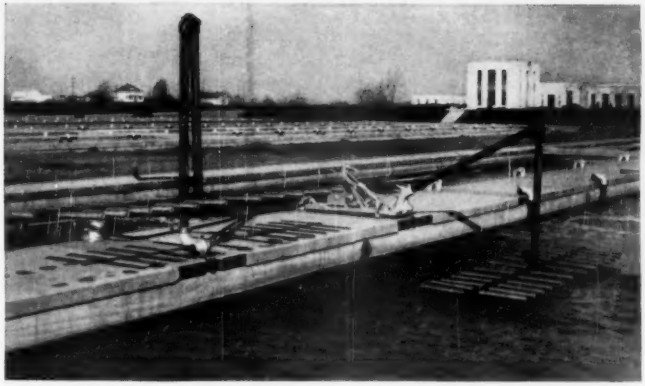
THE OVERWHELMING MAJORITY *specified* "CHICAGO" SWING DIFFUSERS AND PRECISION TUBES

Sewage Treatment Plant
Columbus, Ohio

Paul A. Uhlmann & Associates
ENGINEERS



THE overwhelming majority of Consulting and Design Engineers who planned equipment for Activated Sludge Sewage Treatment Plants in the past five years specified CHICAGO Swing Diffusers and Precision Diffuser Tubes. It's a question of "Diffused Air Economics". Continuous operation of an Aeration Battery is possible only with Swing Diffusers. The most economical operation is possible with Precision Diffuser Tubes.

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SEWAGE EQUIPMENT DIVISION

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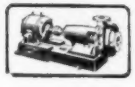

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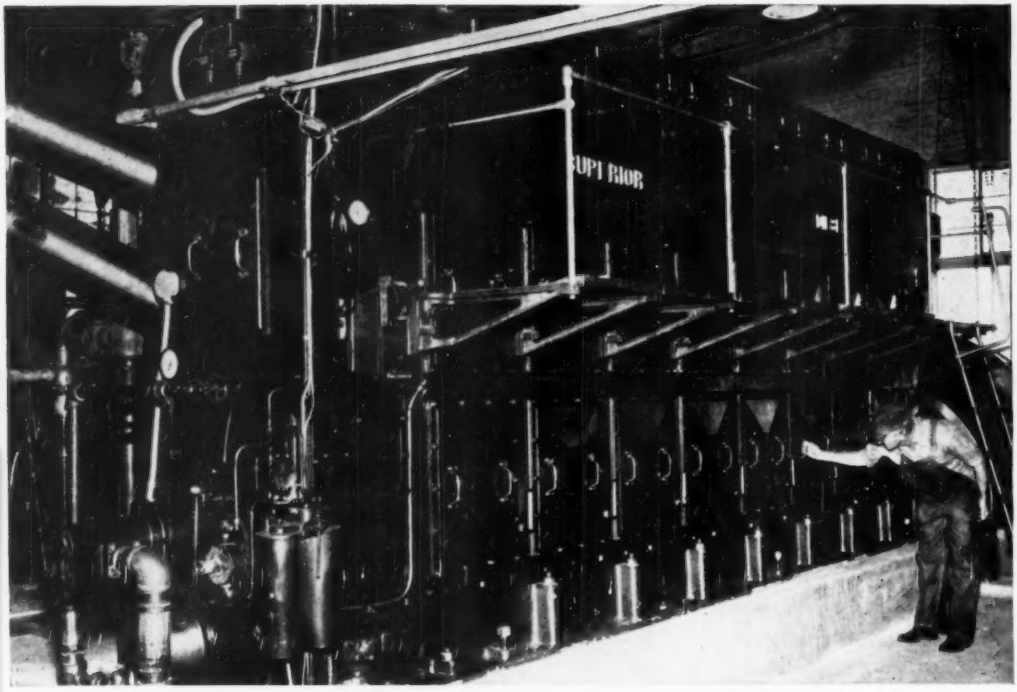

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Folks in a Nebraska town opened the door to lower power costs with a Dual Fuel Superior Diesel. By operating on gas, this Model 80 Dual Fuel Superior saved approximately $10,000 in fuel in six months. What's more, maintenance costs are staying at a low level even when gas is used.

As a result of these substantial savings, this Nebraska town ordered another Model 80 Superior Diesel. This engine is also capable of developing 1440 HP with 1000 KW capacity at 360 RPM on *either oil or gas.*

It's easy to switch from oil to gas or from gas to oil with a Superior. It can be done instantly . . . with a flick of a finger . . . all the operator has to do is push a button.

Our representative can give you all the details on this and other successful Superior installations. Chances are he can help you accomplish the same results. Just write and tell us when he should call or, if you prefer, send for a fully illustrated booklet.

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SUPERIOR ENGINE DIVISION
Plant and General Sales Office: Springfield, Ohio

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THE ENGINEERING AUTHORITY IN THE CITY-COUNTY FIELD

Edited by

W. A. HARDENBERGH and A. PRESCOTT FOLWELL

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The 1950 volume of Public Works will be available on microfilm through University Microfilms, 313 N. First St., Ann Arbor, Mich.

You can't beat McCulloch Chain Saws

on the ground or in a tree

Clearing a right-of-way through mountainous, heavily wooded country involves almost every kind of sawing—topping, pruning, felling, and bucking. The large utility doing the work shown here is using light-weight McCulloch's for the entire job.

The 5-hp, 49-lb. McCulloch makes quick work of big trees. Its light weight saves time between trees in these hills.

The McCulloch 5-49 is shown here with blade swiveled to bucking position; the 3-25 in the background is limbing.

5-49—20, 30, 40, 50 and 60 inch blades and 20 inch bow. Priced from $385

A McCulloch 3-25 dropped this tree in less than a minute, has plenty of power to fell or buck trees 3 or 4 feet thick.

3-25—18, 24, and 30 inch blades and 15 inch bow. Priced from $295

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THE EDITOR'S PAGE

One Hundred and Seventy-Five Years of Military Engineering

LAST month, June 16 to be exact, marked the 175th anniversary of the Corps of Engineers of the Army. Not only the wearers of the castle, but all engineers, have reason to be proud of the record that has been made in this span of years. From one chief engineer and two assistants in 1775, the Corps, in 1945, reached a strength of more than 750,000 men. Two-thirds of them were overseas. What they did is now history. Without them, our industrial power and the skill of our troops would have been largely ineffective. Engineers are indeed essential.

Our congratulations to the Corps of Engineers for the fine job they have done, in peace and in war; and we wish for them continued development and progress. This they have earned, and also the gratitude and the respect of the nation.

Too Much Talk and Most of it Through the Hat

ENGINEERS are normally folks of good sense and judgment, and they are interested in national defense. It must have made a good many of them perturbed and probably disgusted to listen to the rantings of some of the high brass of the army and the air force on Armed Services Day. Some of these talkers practically visualized planes over our industrial centers right then—all loaded with super-atomic bombs, and each able to destroy an entire city with one blast.

If war is that imminent, these men ought to be right on the job getting ready for it, and finding out better ways to utilize the technical and scientific skills of the nation. If war isn't that imminent, then they ought to leave their baloney at home and stop trying to frighten the American people into giving them more and more and more money and more and more and more authority.

Overseas Jobs for Engineers

COINCIDENT with our efforts to develop foreign countries and to help them solve their problems of transportation, sanitation, production and utilization of natural resources, there has been a considerable demand for American engineers.

Your editor has been reluctant to advise high-grade young engineers to accept such positions. After a few years of overseas service, they will return to find that they are behind the times as compared to the men who remained in this country; it may be difficult to find a position comparable in responsibility and income to the one held overseas; and lesser responsibility and lower salary here, or a return to foreign service may be the alternatives.

If our engineers are required for service in developing other countries, there should be an organization in this country which will assist them in locating suitable positions when they return. A perfunctory job service would, of course, be useless. What is needed is a forceful and intelligent organization, able to evaluate the skills of the men concerned, and possessing the confidence of the engineering profession. To this should be added a provision in all foreign-service contracts for severance or part-time pay to provide for (1) retraining men on their return to bring them up to date; and (2) subsistence pending another position.

If we can do this, we can get good engineers for work in foreign countries; we will find better jobs for more engineers; and the profession will benefit from the broader experience of its members. As to the responsibility for initiating such a retraining and job-finding system, we have a strong preference, but no real suggestion. Our preference is that the engineering profession handle this rather than pass it on to the government.

Men and Machines Against the Flood

IN THE winning battle that Winnipeg fought against the flood waters that threatened it, both men and machines won high credit. Without those thousands of men—and women—who filled and placed sandbags and built the dikes higher, machines would not have helped; but without machines, manpower alone would not have been enough.

There is a lesson for all of us in the use of equipment in disaster. Tractors, bulldozers, scrapers, power shovels, electric generating sets and trucks were essential; and we expect that chlorinators, too, did their usual indispensable stint. Of special interest was the large-scale use of diesel-electric sets for supplementing and insuring power for radio, telephone and power service. One set, transported from its American factory to Winnipeg in less than 30 hours, powered a water supply pump that delivered 10 million gallons a day for drinking water and fire protection.

Much more can and should be told of this fight. Here we pause but briefly to congratulate both men and machines.

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To demonstrate Ford Truck Economy

...THROUGHOUT THE UNITED STATES...IN EVERY IMPORTANT TRUCK-USING VOCATION ...IN YOUR KIND OF BUSINESS, WITH YOUR SIZE TRUCKS!

The Ford Truck Economy Run, most realistic economy study in truck history, is now under way throughout the United States.

It's extensive! Thousands of truck users from coast to coast are making the Ford Truck Economy Run over their regular routes. Every important kind of truck-using business is included.

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It demonstrates Ford Truck economy! The Economy Run will demonstrate for everyone to see, what Ford owners have known right along. Ford Trucks do more per dollar in every kind of truck-using business. And this means they will do more per dollar for you in your business!

Economy—one reason why Ford is America's No. 1 Truck Value! And *Value* is one big reason why more and more truck users all over the country are switching to Ford. Ford Trucks are making the truck industry's biggest sales gains.

Switch to Ford Trucks to feel the difference—in your pocketbook. See your nearest Ford Dealer today!

In the long run, too—Ford Trucking costs less because

FORD TRUCKS LAST LONGER

Using latest registration data on 6,392,000 trucks, life insurance experts prove Ford Trucks last longer!

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Safeguard your customers—protect their interests—stop those complaints—enjoy your reputation for quality—specify Wolverine.

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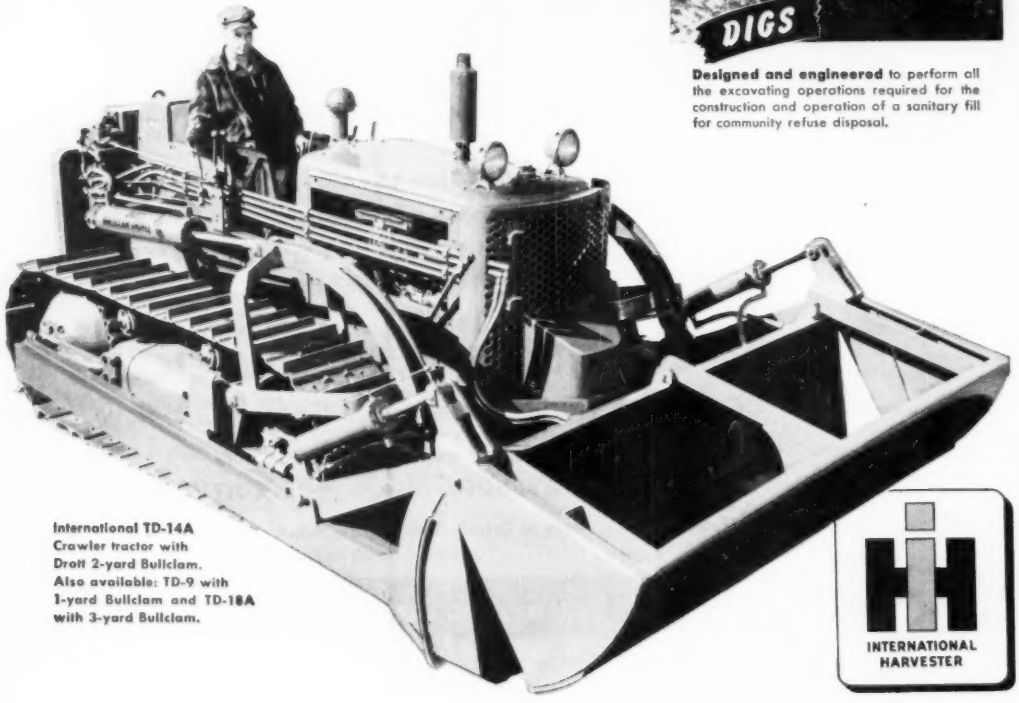
Does the

OF

Nothing compares with the Drott Bullclam and International Crawler tractor combination for building a *Sanitary Fill*—the only equipment specifically designed and engineered to perform efficiently all phases of *Sanitary Fill* construction and operation. It does the whole job alone, turning wasteland and community refuse into valuable, raised recreational areas. Playgrounds, ballparks—even airports—replace expensive, disease-breeding dumps in any community when this Tractor and Bullclam unit takes on the refuse-disposal job.

Designed and engineered to perform all the excavating operations required for the construction and operation of a sanitary fill for community refuse disposal.



International TD-14A Crawler tractor with Drott 2-yard Bullclam. Also available: TD-9 with 1-yard Bullclam and TD-18A with 3-yard Bullclam.

INTERNATIONAL HARVESTER

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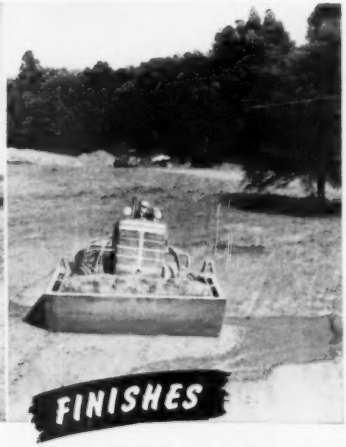
Complete Job-
SANITARY FILL

Designed and engineered to compact bulky refuse thoroughly, not only with tractor treads but, in addition, with the exclusive Bullclam ironing and crushing action.

Designed and engineered to secure and transport cover material while excavating additional disposal area. It spreads this material smoothly over the compacted refuse.



Designed and engineered to do the final levelling and grading of the completed sanitary fill area, preparing it for immediate public use for recreation, parking, etc.

■ Dependable and economical International Crawler tractors equipped with Drott Bullclam shovels, can be your community's greatest benefactors, just as they have been for others throughout the country. They'll cut refuse-disposal costs, eliminate the unsightly dump or smoking garbage burner while contributing new land for public pleasure.

Look into the possibility of cleaning up your refuse-disposal problems with this versatile *One-Man Sanitary-Fill Builder*. Contact your International Industrial Power Distributor and ask him to demonstrate. For detailed information on the Drott Bullclam Method of Sanitary Fill, write Drott Manufacturing Corp., Milwaukee 8, Wisconsin.

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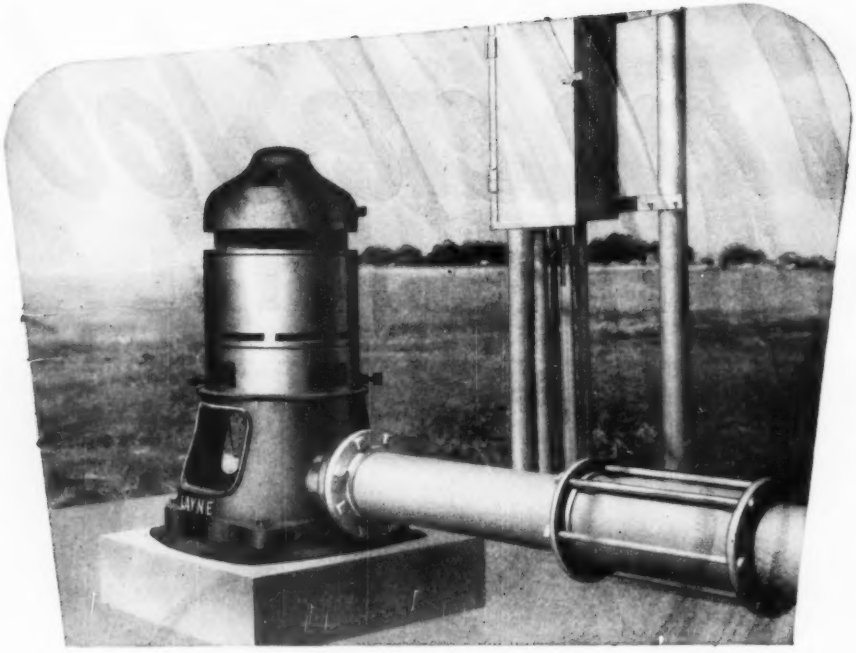

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If your requirements call for a Well Water System of utmost dependability, and one that must serve for a long period of years with little or no upkeep expense, you are urged to check the features of those built by Layne. The experience of nearly seventy-five years has gone into their design and construction. With thousands of installations scattered throughout the world, Layne has had an unmatched opportunity to find, correct and greatly strengthen every possible weak point of construction. Constant improvement of design has made them the world's most efficient.

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Layne will gladly, without obligation, give helpful information on any water supply problem. For further information, literature, etc., address

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For 94 years the water works industry has relied upon McDonald for dependable brass goods. Keeping this trust is a McDonald tradition. Correct engineering design, experienced metalurgists, modern foundry methods and skilled craftsmen all combine to make McDonald "Diamond Line" items the finest that can be produced. Every item is made of 85-5-5-5 metals and individually inspected and tested to meet the quality demands of the most exacting users.

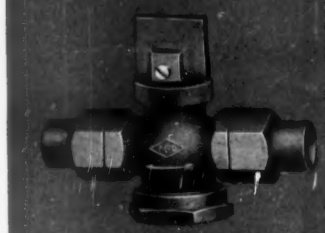
For service, for lasting satisfaction depend upon McDonald. Stocks are readily available. Write for literature and prices.

E-4753 Male iron pipe thread at one end, and for copper service pipe other end.

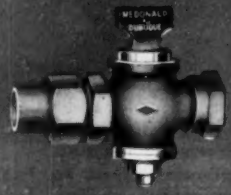
E-4754 Female iron pipe thread at one end, and for copper service pipe other end.

E-4756 For copper service pipe both ends.

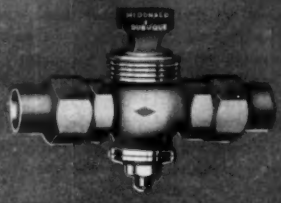
E-4701 Composition stop for copper service pipe.



E-4713 Combined cop and tee handle inverted key curb stop, both ends for copper pipe.



E-4721 Solid brass tee handle curb stop. Inlet copper pipe. Outlet iron pipe thread.



E-4727 Curb stop for copper service pipe. Minneapolis pattern. Solid brass tee handle.

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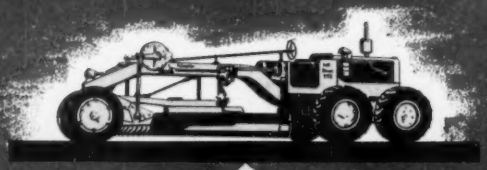
FOR MORE WORK



SPEED
WEIGHT
POWER

"NEVER tried to do anything we couldn't get done," says A. R. Carter, Superintendent of Highways, Winnebago County, Ill., of the "Cat" No. 12 Grader shown here.

That's because "Caterpillar" Motor Graders are balanced. Each is built from the ground up as an individual unit. The correct weight, plus the right horsepower, plus rated work speed—these things add up to *balanced* machines that solve your job problems at lower cost.

Informed buyers are finding that *assembled* motor graders are often poorly balanced. It stands to reason that when one engine or one frame is used for more than one model, the best use cannot be made of weight and power. But balanced "Cat" Graders give maximum work capacity because each has its own frame, its own weight, its own horsepower, with properly balanced working speeds. Neither muscle-bound nor jumpy on the job, their matching power cuts costs through superior performance and longer life.

There's a size "Cat" Motor Grader for every type of work—with the stamina, punch and balance to do a particular job best. And don't forget for a minute what world-famous "Caterpillar" dealer service means in terms of genuine factory parts, factory-trained servicemen, and dealer representatives who are experts on job application. Ask your "Caterpillar" dealer to show you the "Cat" Motor Grader's extra-quality bonus features. They range from tough blades with the maneuverability of a boarding-house reach to "Hi-Electro" hardened final drive gears built to last.

LOOK UNDER THE HIDE

Fuel pumps are "Caterpillar"-designed and "Caterpillar"-built. Made of the cleanest high-chromium, high-carbon alloy steel obtainable, the pump plungers and barrels are diamond lapped. Pumps are heat-treated to maximum hardness to give users thousands of hours of trouble-free economical service. There is an individual pump for each cylinder. Pumps are adjustment-free and completely interchangeable. Look under the hide for quality—it doesn't show on the outside, it shows up in performance.

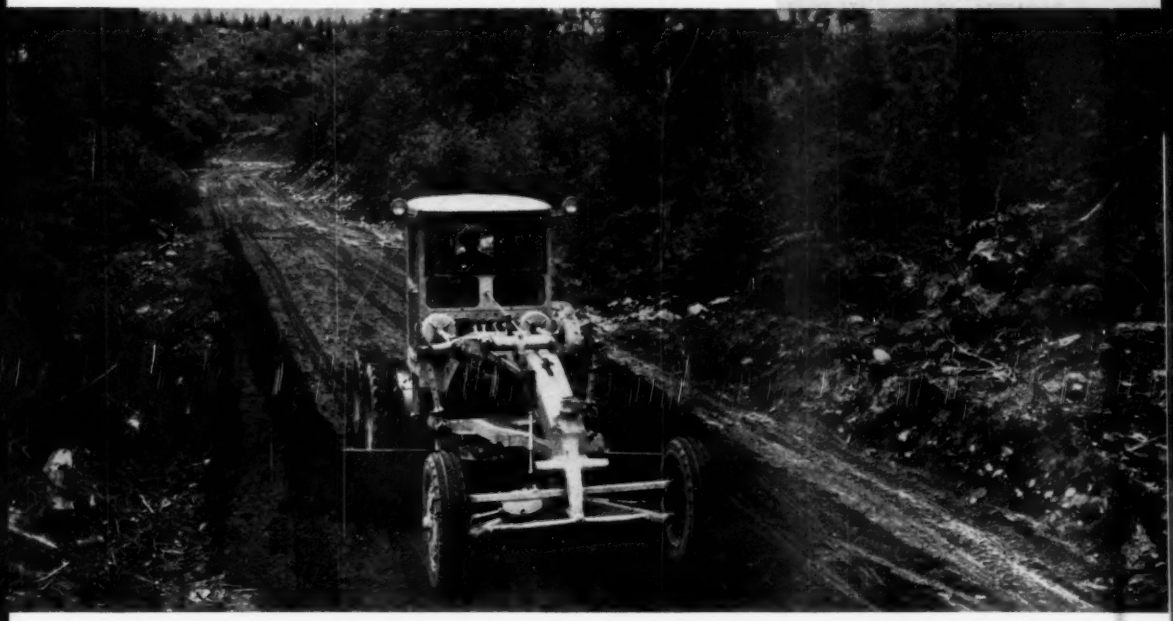
CATERPILLAR

REG. U. S. PAT. OFF.

"Cat" Graders

AT LESS COST

This "Cat" No. 12 Motor Grader is trenching for stone near Rockford, Ill. County Supt. of Highways A. R. Carter uses it for grading, oil mix, snowplowing, ditching, new road construction. He says, "For getting the job done it's in a class by itself. Our No. 12 gets the heavy work anywhere in the county!"



NO. 12

In a No. 12 "Cat" Motor Grader you get a No. 12 from stem to gudgeon. The "Cat" Engine was built for a frame that gets full use out of its 100 hp. And the working speed range was engineered to get maximum production at each speed.

WEIGHT	22,200 lbs.
ENGINE	100 hp.
SPEEDS: 1st	2.3 mph.
2nd	3.6 "
3rd	5.5 "
4th	8.5 "
5th	12.0 "
6th	19.3 "
1st R.	2.7 "
2nd R.	4.1 "

Price of the standard model No. 12 is $10,920, f.o.b. Peoria, subject to change without notice.

NO. 112

With the No. 112 you get the No. 112's 75 hp. Engine on a No. 112 frame, with a No. 112 weight and a No. 112 transmission. You don't get mismatched power, weight or speed.

WEIGHT	19,330 lbs.
ENGINE	75 hp.
SPEEDS: 1st	2.1 mph.
2nd	3.0 "
3rd	4.0 "
4th	5.6 "
5th	11.2 "
6th	16.0 "
1st R.	2.8 "
2nd R.	4.0 "

Price of the standard model No. 112 is $9545, f. o. b. Peoria, subject to change without notice.

NO. 212

When you buy a No. 212 you get the same balanced performance. It has its own weight, its own frame, its own "Cat" Engine, its own working speeds.

WEIGHT: tandem drive	13,290 lbs.
single drive	11,010 "
ENGINE	50 hp.
SPEEDS: 1st	2.0 mph.
2nd	3.1 "
3rd	4.9 "
4th	11.9 "
R.	2.8 "

Price of the standard model No. 212 is $6435, f. o. b. Peoria, subject to change without notice.

DIESEL ENGINES • TRACTORS
MOTOR GRADERS
EARTHMOVING EQUIPMENT

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

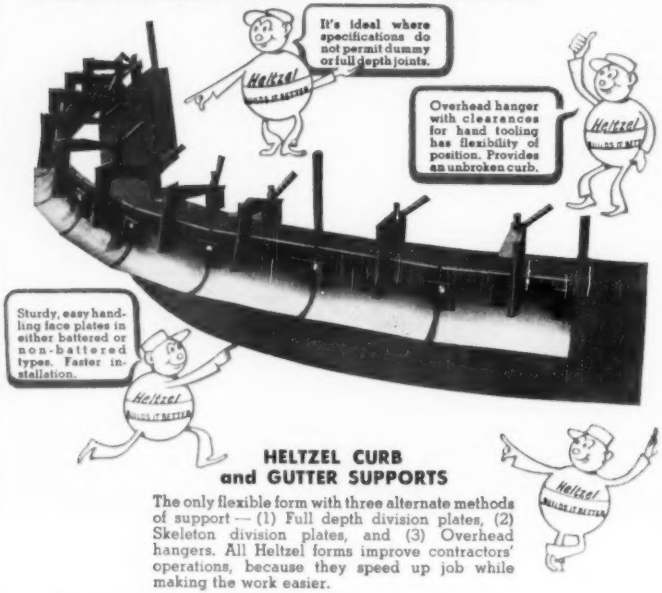
Heltzel BUILDS IT BETTER

HELTZEL

SUPERIOR CURB & GUTTER *Forms*

Demand for Heltzel forms comes from experienced contractors who know Heltzel forms save time and money. TIME — because firmer installations can be made faster. MONEY — because Heltzel equipment lasts longer and involves less labor on the job. The example below of a flexible form is typical of Heltzel better built forms.

- CURB FORMS & ACCESSORIES
- COMBINED CURB & GUTTER
- SIDEWALK FORMS
- RIGID RADIUS FORMS
- FLEXIBLE FORMS
- SPECIAL FORMS


It's ideal where specifications do not permit dummy or full depth joints.
Overhead hanger with clearances for hand tooling has flexibility of position. Provides an unbroken curb.
Sturdy, easy handling face plates in either battered or non-battered types. Faster installation.

HELTZEL CURB and GUTTER SUPPORTS

The only flexible form with three alternate methods of support — (1) Full depth division plates, (2) Skeleton division plates, and (3) Overhead hangers. All Heltzel forms improve contractors' operations, because they speed up job while making the work easier.

PUT HELTZEL TO WORK MAKING MONEY FOR YOU

Before you buy, before you start a job — check with Heltzel! Heltzel better built curb and gutter forms in standard types will save for you. Special shapes designed by Heltzel to job specifications make difficult jobs click like run-of-mine work. Write for information now.

HELTZEL STEEL FORM & IRON CO., WARREN, O., U.S.A.

Please send information regarding: G

CURB and GUTTER FORMS _____

ROAD and AIRPORT FORMS _____

BATCHING PLANTS and BINS _____

Firm _____

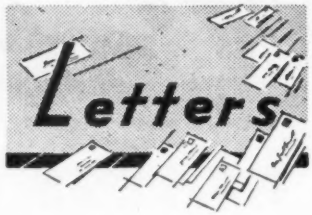
Address _____

City _____ State _____

Signed _____

HELTZEL STEEL FORM & IRON CO. WARREN, OHIO · U. S. A.

When you need special information—consult READERS' SERVICE DEPT. on pages 79-83.



OUR BEST WISHES

I have retired as county engineer of Lee Co., which position I have held for over 25 years, and I am just looking at the flowers and listening to the birds. You know there is something to that new song: "It's later than you think."

I want to tell you how much I have enjoyed your magazine over the past years and I am really going to miss it for I looked forward to it as much as any publication I received.

W. Glenn Gibson
Fort Myers, Fla.

(Ed Note: With our compliments, Mr. Gibson, you will continue to receive Public Works; and we wish you a happy time with the birds and the flowers, and maybe a little engineering.)

TODAY AND YESTERDAY

We congratulate you on the "Water Works Today and Yesterday" section in the May issue. . . We believe that everyone of your readers in the water works field will be interested in the attractive arrangement of architectural renderings, photographs of completed buildings, interior views and construction projects.

Milo E. Smith
Chicago Bridge & Iron Co.
Chicago, Ill.

STREET SWEEPERS

We are in the market for a street sweeper that will collect the dirt and transport it to the dump, as our dumping areas are fairly close to our sweeping operations. We prefer this method of handling to dumping the sweepings on the street and collecting them later.

R. K. McGillivray,
Director of Public Works,
Bay City, Mich.

CIVIL DEFENSE

Your editorial in the April issue on "What About that Civil Defense Program" is timely. I have studied

the Hopley report but understand it was not adopted and that civil defense is now a function of the National Security Resources Council. Can you tell me where and how to get the latest material on this subject.

Ira D. S. Kelley,
City Manager,
Newton, Kans.

(Ed. Note: So far as we know, the Hopley report is the latest material available. We believe, as we stated in the editorial, that it is time some leadership, hitherto sadly lacking, was available in this field, especially for professional men.)

OUR SNOW PLOW NEEDS

I am referring to your April editorial "What This Country Needs in the Snow Plow Line." Only a few people realize the amount of effort expended by public officials to keep the streets and roads cleaned of snow at a reasonable cost. To the majority of people, plugging their drives is a major offense, exceeded only by that of being a "red." As a result of this attitude, we have tried some experiments which have relieved the pressure considerably.

We have established a driveway service and make a season charge of $5 for small driveways and $10 for large driveways for each driveway owner who makes application.

Results have been most gratifying in that complaints have been held to a minimum. In our Villages, sidewalk plows are used for this purpose and are so timed that their work will follow that of the street plows. On country roads, the highway plows take care of driveways on their last trip over the road. When plows are widening a highway after a storm, a fast hydraulic wing works quite effectively by raising it just before arriving at a driveway and dropping it flat on the ground in the driveway.

These are but simple home remedies for a lot of little headaches, but it is my belief that they may have averted a bloody revolution in our case. I realize this letter is untimely, but if these ideas are of any use to you or your readers, you are welcome to it.

A. C. Davis,
Manager, Town of Hartford,
White River Junction, Vt.

(Ed. Note: Fine idea; thanks; Ridgewood, N. J., can have my five bucks any time.)

(*More on page* 22)

May we assist you, sir?

If you're on a merry-go-round about handling air or gas, *R-C dual-ability* can help you.

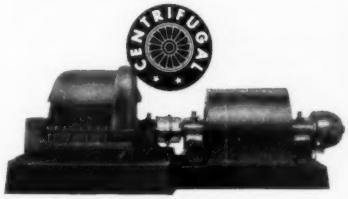
That's been our exclusive job for almost a century. We've developed the most extensive line of blowers, exhausters and gas pumps in the industry, with capacities from 5 cfm to 100,000 cfm.

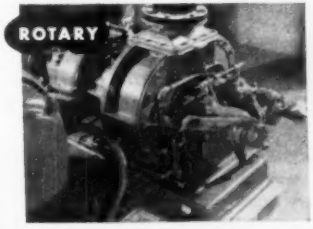
We're the only builders offering that *dual choice* of both Centrifugal and Rotary Positive equipment. Thus, without bias, we can suggest units that meet most closely the requirements of the work to be done.

For new installations or replacements, look to us for your needs. Alert engineering teams up with modern construction to insure long-time, satisfactory performance of R-C equipment.

ROOTS-CONNERSVILLE BLOWER CORPORATION
507 Poplar Avenue, Connersville, Indiana

One of three Type H, 3-stage Centrifugal Blowers in large sewage disposal plant. Capacity 15,000 cfm, driven by 700 hp electric motor.





Type HD Rotary Positive Blower in sewage disposal work. Variable capacity from 491 cfm to 1,000 cfm. Motor driven.

ROOTS-CONNERSVILLE BLOWER BUILDERS R-C SINCE 1854
ONE OF THE DRESSER INDUSTRIES

You Get these Big Bonuses

only with ALLIS-CHALMERS POSITIVE SEAL 1000 HOUR LUBRICATION . . . . .

Allis-Chalmers Model HD-5 — 40.26 drawbar hp. — with Baker engine-mounted bulldozer.

On all Allis-Chalmers crawler tractors, you can operate six months on a 40-hour week basis with just one lubrication of truck wheels, front idlers and support rollers — units that are normally subjected to the greatest wear and are most difficult to service properly. Think what this elimination of daily or even weekly attention means in labor and lubricant savings . . . and in working time gained! Think of the safety factor, too — no costly damage by greasing neglect.

Look At These Bonuses

DAILY GREASING PERIODS ARE ELIMINATED . . . there's less downtime, more productive operating time.

SAFETY FACTOR AUTOMATICALLY PROTECTS TRACTOR OPERATION . . . adequate lubrication is assured for long operating periods . . . no costly damage by greasing neglect.

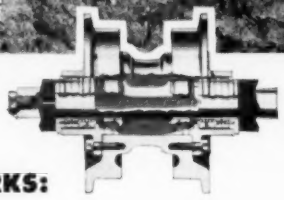
REPAIR PARTS EXPENSE HELD TO MINIMUM. Operator can safely select convenient time and spot to replenish lubricant.

FULL PROTECTION IS ASSURED . . . grease kept in, dirt kept out. Daily cleaning of grime and dirt from truck frame to get at grease fittings is eliminated.

LUBRICANT COST REDUCED. Units are grease packed at the factory. Thereafter lubricant need be replaced only once every 1,000 hours.

REDUCED FRICTION DELIVERS MORE POWER. Equipped with tapered roller bearings, wheels rotate smoothly inside and out. Bearings are located directly under the load—reduce side thrust and wobble—last longer . . . easily serviced.

ADDED UP, THESE BONUSES MEAN SAVINGS IN MATERIAL AND LABOR COSTS PLUS GREATER TRACTOR PRODUCTION. THOUSAND HOUR LUBRICATION ADDS MORE THAN *TWELVE FULL DAYS* TO THE TRACTOR'S OUTPUT *EVERY SIX MONTHS.*



HERE'S HOW IT WORKS:

Designed and constructed with tapered roller bearings and Positive Seals, the truck wheels, front idlers and rollers are not affected by dust, loose sand, soft ground, mud or water.

The seal consists of two steel rings, hard and smooth as glass, held together tightly by steel coil springs. One seal ring is stationary, one turns with the wheel. The sealing surfaces are ground to within several millionths of an inch of perfect flatness and are lubricated, as are the tapered roller bearings, from a large grease reservoir sealed inside the wheel.

Flush Lubrication Protects Positive Seal Faces

Pumped easily into the shaft channels, lubricant washes smoothly through the rear and front roller bearings, then back to the shaft, flushing out past the grease gun nozzle. Old grease is replaced by clean, fresh lubricant. Low-pressure, flush-type lubricating action eliminates seal popping . . . keeps seal face smooth and clean of grit and dirt . . . reduces wear . . . increases seal life.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

For Greater Production • For Easier Operation • For Simplified Servicing

Presenting the New

FEDERAL *Style LINER* SERIES

The Most Beautiful Trucks in America!

Here's the Truck . . .

THOUSANDS OF FLEET OPERATORS ASKED FOR!

In a nationwide survey, thousands of fleet operators confirmed the judgment and sound engineering back of the more than one hundred new and improved all-truck features built into the new Federal Style Liners . . . 30% greater strength . . . 60% greater vision . . . 100% greater accessibility . . . ultra smart styling . . . unrivaled beauty . . . massive appearance . . . extra wide and roomier cabs . . . unparalleled comfort . . . easier steering and new high standards of performance make these new Federals today's outstanding truck value. There is a large selection of Style Liner models . . . also a choice of several powerful high torque engines and wheelbases to economically master your hauling needs. Make a date with your Federal dealer now to drive a new Style Liner. It doesn't cost any more to own a new Federal—the truck that has everything.

FEDERAL MOTOR TRUCK COMPANY, DETROIT 9, MICH., U. S. A.

"I SAW MOTOR TRUCK HISTORY IN THE MAKING"

Says Lowell Thomas

Internationally known newscaster, writer and explorer.

Read his booklet describing the new Federal Style Liner trucks. Mail coupon below today for your free copy.

Federal Motor Truck Company,
Detroit 9, Michigan, U. S. A.

Send me a free copy of Lowell Thomas' booklet "I Saw Motor Truck History In The Making".

Name_____

Company_____

Address_____

City_____ Zone____ State_____

FEDERAL TRUCKS

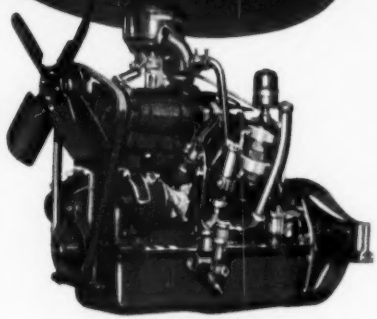
More Proof Why

FEDERAL *Style LINER*

IS YOUR BEST TRUCK BUY!

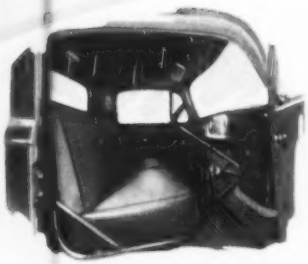
- ★ Longer, "smoother ride" front and rear springs for greater comfort—bigger payloads.
- ★ Rubber bushings in front springs and shackles provide quieter operation—longer spring life.
- ★ Heavy duty, wider track front axles for shorter turning radius.
- ★ Spring cushioned radius rod drive gives longer spring and axle life.
- ★ Built-in running boards with tool and battery compartments in step-wells for greater convenience.
- ★ Husky hypoid rear axles—the strongest ever built for the toughest handling jobs.
- ★ Pressurized cooling and increased radiator frontal area assures maximum engine performance.
- ★ Cabs have heavy duty chrome plated hardware. Doors are equipped with three heavy duty hinges.
- ★ Propeller shaft designed for maximum angle drive to rear axle. Shaft center bearing is rubber mounted for quiet, long life operation.
- ★ Big, sturdy brakes with wide lining area—stop quickly—operate cooler—last longer.
- ★ Powerful clutches with larger facing areas assure positive engagement—dependable service.
- ★ Heavy duty 4 or 5 speed transmissions of ample torque capacity for—quiet operation—easy shifting.

Over 100



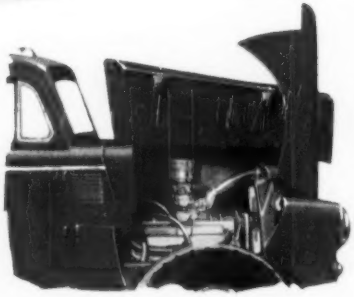
BIG, POWERFUL ENGINES

These husky, all-truck Federal engines are designed for maximum operating economy and dependable, long-life performance.



GREATER COMFORT, ROOMIER CAB

Seats accommodate three large men easily and are readily adjustable. Cabs are double insulated for all-weather protection.

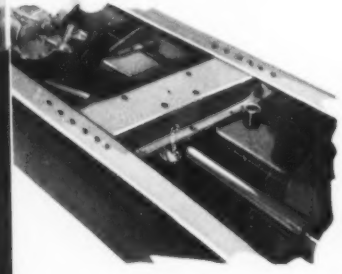


100% GREATER ACCESSIBILITY

New, exclusive "Swing-Lift" fender simplifies maintenance on engine, steering, front brakes, etc.—reduces down time—cuts repair costs.

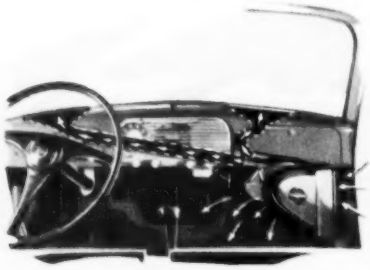
60% GREATER VISION

One piece, full width, bent safety glass windshield insures maximum visibility—eliminates distortion. Dual electric windshield wipers standard equipment.



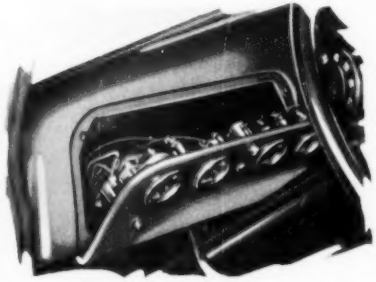
30% GREATER STRENGTH

Massive, sturdy frame side rail dimensions substantially increased and cold riveted for maximum strength and durability.



ALL-WEATHER AIR CONDITIONING

Fresh air heater and defroster is available with cowl intake vent, thermostatically controlled for all-weather driving comfort.



ACCESSIBLE WIRING PANEL

Electrical wiring under cowl is readily exposed by opening a door in instrument panel. Wires are colored for easy tracing of circuits.

FEDERAL TRUCKS

SEND FOR THIS DIGEST OF FACTS ABOUT TRANSITE PRESSURE PIPE

Engineering Facts about
Johns-Manville
TRANSITE PRESSURE PIPE
JM
This booklet contains reprints of current Transite Pressure Pipe advertising to the water works industry. Additional information may be obtained from any of the 60 Johns-Manville offices listed on the back cover.

SOME OF THE SUBJECTS COVERED IN THIS BOOK:

- Installation Economies
- Carrying Capacity
- The Simplex Coupling
- Making Service Connections
- Resistance to Corrosion —an Index of Long Life
- Case Histories
- Dimensions and other useful data

If you operate a water system . . . or are concerned with the design or construction of water works projects you'll find this digest of facts about Johns-Manville Transite* Pressure Pipe helpful.

A compilation of the advertisements in our current "Engineering Facts" series, it presents concise, factual information about Transite's many economic and engineering advantages . . . includes informative case histories that give a new perspective on how this asbestos-cement pipe meets today's requirements for a modern, efficient water carrier.

In addition, it contains dimensions and other useful data about Transite Pressure Pipe which you'll want to have in your files. A copy is yours for the asking. Write Johns-Manville, Box 290, New York 16, N. Y. or use the coupon below.

*Transite is a registered Johns-Manville trade mark

Johns-Manville TRANSITE PRESSURE PIPE

JM

Johns-Manville
Box 290, New York 16, N. Y.

Send me a copy of "Engineering Facts about Johns-Manville Transite Pressure Pipe" (TR-78A).

Name .....

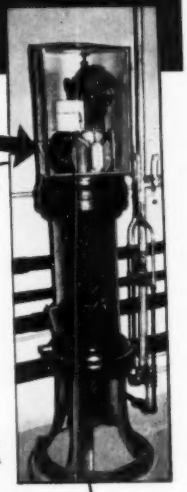
Organization .....

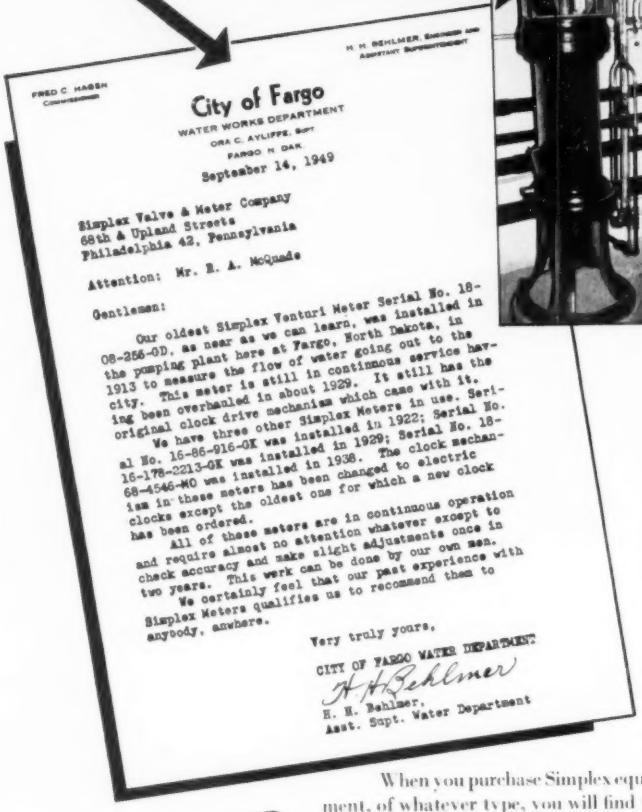
Address .....

PW-7

When writing, we will appreciate your mentioning PUBLIC WORKS

IN CONTINUOUS OPERATION SINCE 1913 WITH ONLY ONE OVERHAUL!





FRED C. HAGEN
Commissioner

H. H. BEHLMER, Engineer and
Assistant Superintendent

City of Fargo
WATER WORKS DEPARTMENT
ORA C. AYLIFFE, Supt.
FARGO, N. DAK.

September 14, 1949

Simplex Valve & Meter Company
68th & Upland Streets
Philadelphia 42, Pennsylvania

Attention: Mr. E. A. McQuade

Gentlemen:

Our oldest Simplex Venturi Meter Serial No. 18-08-256-OD, as near as we can learn, was installed in the pumping plant here at Fargo, North Dakota, in 1913 to measure the flow of water going out to the city. This meter is still in continuous service having been overhauled in about 1929. It still has the original clock drive mechanism which came with it.

We have three other Simplex Meters in use. Serial No. 16-86-916-OK was installed in 1922; Serial No. 16-178-2213-OK was installed in 1929; Serial No. 18-68-4546-MO was installed in 1938. The clock mechanism in these meters has been changed to electric clocks except the oldest one for which a new clock has been ordered.

All of these meters are in continuous operation and require almost no attention whatever except to check accuracy and make slight adjustments once in two years. This work can be done by our own men.

We certainly feel that our past experience with Simplex Meters qualifies us to recommend them to anybody, anywhere.

Very truly yours,

CITY OF FARGO WATER DEPARTMENT
H. H. Behlmer
H. H. Behlmer,
Asst. Supt. Water Department

When you purchase Simplex equipment, of whatever type, you will find the same features of ruggedness, long life, low maintenance cost, and accuracy as did the user of the meters at Fargo, North Dakota.

For full information, write to Simplex Valve & Meter Company, Dept. 7, 6750 Upland Street, Philadelphia 42, Pa.

IT'S SIMPLEX
IT'S ACCURATE

SIMPLEX
VALVE AND METER COMPANY

When you need special information—consult READERS' SERVICE DEPT. on pages 79-83.

SEATTLE RESURFACING

I am writing this letter to correct some impressions given by Mr. J. F. Cooke in an article in your March issue, "Concrete Resurfacing—New Pavements for Old." Mr. Cooke cites the example of the city of Seattle, Wash., by stating: "The experiences of Seattle in concrete resurfacing more than 323,000 square yards of streets should interest many city officials contemplating similar rehabilitation." In making this statement, there was no reference to the 2,434,334 sq. yds. of asphaltic concrete resurfacing in Seattle during the past five years. . . Since 1944, resurfacing of old pavements with asphalt will average 95% of the total.

Rodney P. Ryker,
District Engineer,
The Asphalt Institute,
Seattle, Wash.

(Ed. Note: When we asked Mr. Cooke to prepare this article for us, we requested him to tell our readers how to lay portland cement concrete resurfacing. Since the matter of comparative quantities of different types of surfacing laid in any or all areas was not involved in the material we asked him to prepare, we feel that the above letter is rather beside the point. However, we are publishing a portion of it; the entire letter would require more space than is available in this section.)

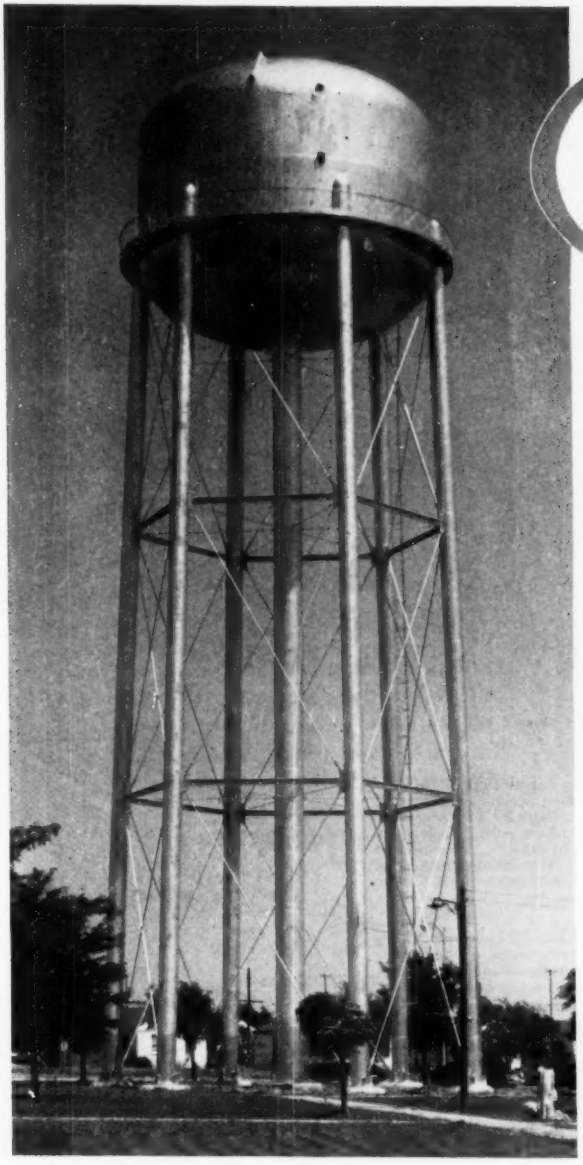
BOOKS IN BRIEF

SOIL MAPS

Bulletin 22 covers the use of county soil maps and the profile method in soil survey practice. The bulletin also contains a paper on the use of such maps for making soil surveys, another paper on their use in connection with landing strips, and a tabulation showing the areas presently covered by such maps. Highway Research Board, 2101 Constitution Ave., Washington 25, D. C. $1.80.

CRAWLER TRACTOR SERVICE MANUAL

A new 220-page Manual gives complete instructions for proper operation, maintenance and repair of the Allis-Chalmers HD-5 tractor. There are 23 sections, each devoted to a specific subject. $3. Write Allis-Chalmers Mfg. Co., Tractor Division Service Dept., Box 512, Milwaukee 1, Wisc.



Horton elevated tanks are available in standard capacities from 5,000 to 3,000,000 gallons. Municipal installations are built in accordance with American Water Works Association Specifications.

DUMAS does much

to improve water service

✔***provides gravity water pressure***—Dumas, Texas, recently increased the amount of storage in elevated tanks in its water system to 350,000 gals. by installing the 300,000-gal. Horton* tank shown at the left. This tank is one of the major improvements made since a City Commission took over management of the system in May, 1947. Other improvements include a new 325,000-gal. reservoir, three deep wells, and nine miles of distribution mains.

✔***meets huge increase in demand***—Since 1947, the number of customers served has increased from 765 to 1350, a jump of 75 per cent. Average daily consumption has risen from 380 to 425 gallons per customer. The water works engineers at Dumas state that elevated storage was a big factor in the successful handling of these increases.

✔***lowers fire insurance rates***—The 1949 key rate is $0.42 compared to $0.56 in 1946—that's a drop of 33 1/3 per cent. Every property owner in Dumas now pays less for his fire insurance — thanks to the protection provided by this Horton tank and other improvements.

Why are so many cities modernizing their water systems by installing elevated tanks? Because the reserve in a Horton tank provides an extra margin which can be used to meet peak loads and smooth out pressure fluctuations. This reserve is always available for fire protection too — and that often lowers insurance rates. Write the nearest office for full details on how a Horton elevated tank can improve water service in your community.

**Trademark Registered at U. S. Patent Office*

HORTON

STEEL STORAGE TANKS ...for municipal service

CHICAGO BRIDGE & IRON COMPANY

Plants in Birmingham, Chicago, Salt Lake City, and Greenville, Pa.

Atlanta 3	2123 Healey Bldg.	Los Angeles 17	1108 General Petroleum Bldg.
Birmingham 1	1532 North Fiftieth St.	New York 6	3316-165 Broadway Bldg.
Boston 10	1038-201 Devonshire St.	Philadelphia 3	1648-1700 Walnut St. Bldg.
Chicago 4	2115 McCormick Bldg.	Salt Lake City 4	539 West 17th South St.
Cleveland 14	2221 Guildhall Bldg.	San Francisco 14	1525-200 Brush St.
Detroit 26	1536 Lafayette Bldg.	Seattle 1	1339 Henry Bldg.
Houston 2	2142 National Standard Bldg.	Tulsa 3	1641 Hunt Bldg.

TODAY'S FILTER PLANTS . . .

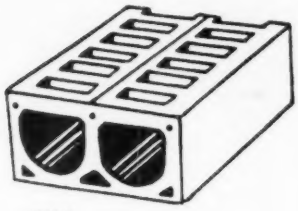
use vitrified clay filter bottom blocks

General view of the Bryan, Texas, Sewage Treatment Plant designed by Freese, Nichols and Turner to treat an average sewage flow of 1.75 MGD.

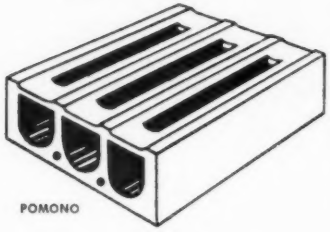
The two stage, high capacity trickling filter plant at Bryan, Texas, is designed to serve 25,000 population. Plant units include mechanically cleaned screen; grit channel; three 65' dia. clarifiers for primary, intermediate and final settling; two high capacity filters, each 52' dia. with 8' stone depth; and one 65' dia., 20' s.w.d. digester. Provision is made for recirculation in both filter stages. The filter media is, of course, supported on vitrified clay filter bottom blocks. R. B. Butler, Inc., of Bryan, Texas, is the General Contractor.

Consulting and supervising engineers are Freese, Nichols and Turner of Houston, Texas. This firm, established in 1946, serves as engineering consultant for water and sewage works, paving, drainage, airports, dams, electrical distribution and power, and operates principally in the Texas Gulf Coast area. They have recently completed a filter plant for Brenham, Texas, similar to the Bryan plant, and are currently engaged in sewage treatment design for Corpus Christi.

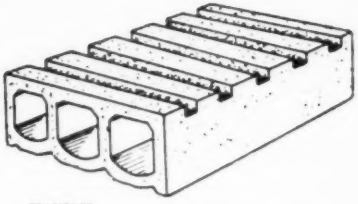
By specifying *Vitrified Clay Filter Bottom Blocks* made by members of the Trickling Filter Floor Institute, engineers for today's filter plants are sure of scientifically designed blocks with large top openings and smooth, trouble-free channels that insure best operating results. On your next job specify these proven blocks that resist acids, won't clog and are easy to lay. Any Institute member will send engineering data.



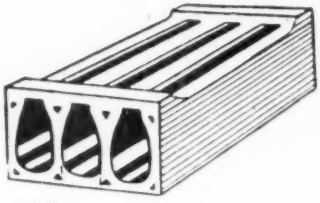
BOSCO



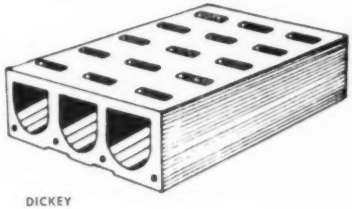
POMONO



TRANSLOT



NATCO



DICKEY

TRICKLING FILTER FLOOR INSTITUTE

AYER-McCAREL-REAGAN CLAY CO. Brazil, Ind.

NATIONAL FIREPROOFING CORP. Pittsburgh 12, Pa.

BOWERSTON SHALE CO. Bowerston, Ohio

POMONA TERRA-COTTA CO. Pomona, N. C.

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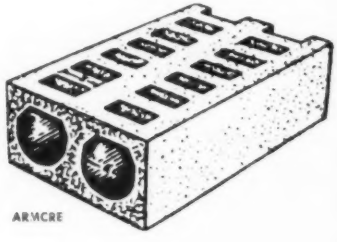


ARMCRE

When you need special information—consult READERS' SERVICE DEPT. on pages 79-83.

COMING!

FOOD WASTE DISPOSERS REQUIRED BY LAW!

Within the next few years, more and more city officials will earn the thanks of their communities by taking the lead in abolishing garbage . . . and the unpleasantness and the health hazards that go with garbage. People want the food waste disposer—not just for themselves, but for the HOMES NEXT DOOR and across the street; they don't want garbage at their own back doors . . . OR ACROSS THE ALLEY. Forward-thinking officials now sponsoring ordinances requiring this modern, sanitary method of eliminating garbage in all new construction are pioneers of a new era.

The streets, alleys, and back doors of this new development will speak well of its residents—and of the builder, who recognized the popular appeal of a garbageless community. Alert city officials can accomplish this same garbageless, healthier, more pleasant standard of living on a *city-wide* basis!

From the viewpoint of health, efficiency, and service-free operation, consider these advantages of the Youngstown Kitchens Food Waste Disposer:

1 Food waste can be fed in *continuously*. No waiting for a load to be shredded and flushed with the Youngstown Disposer.

2 Youngstown rotary shredder turns in opposite direction each time switch is turned on, doubling life of cutting edges.

3 Direction of water swirl reverses each time switch is turned on, for *complete self-flushing*. Super-hard, chrome-plated steel shredders stay sharp and bright.

Youngstown Kitchens
FOOD WASTE DISPOSER

MULLINS MANUFACTURING CORPORATION • WARREN, OHIO
World's Largest Makers of Steel Kitchens

FOR EVERY STEP OF YOUR SEWAGE TREATMENT PROCESS

WHEN you specify INFILCO Sewage Treatment Equipment, you get more than just equipment. Actually, you specify over 50 years experience in the design and manufacture of a *complete range* of water, sewage and waste treatment equipment.

You have *one source* to depend upon for experience in both chemical and biological treatment . . for the major equipment items as well as the important control devices. And by providing a *complete range* of sewage treatment equipment INFILCO offers the all-important advantage of *undivided responsibility!*

A complete laboratory and staff of competent engineers are available for making recommendations and reports to the consulting engineer or his client. It is, of course, intended that this service shall cooperate with the work of your engineers. When considering your next sewage treatment plant, or the modernization of an existing one, consult your Telephone Red Book. Call in your nearest INFILCO Field Engineer!

SEND FOR . .

Bulletin No. 60-C. It illustrates and describes many items of Infilco Equipment.

INFILCO

• BETTER WATER CONDITIONING AND WASTE TREATMENT SINCE 1894

INFILCO INC.

GENERAL OFFICES, 325 WEST 25th PLACE • CHICAGO 16, ILLINOIS

SALES OFFICES IN TWENTY SIX PRINCIPAL CITIES

WORLD'S LEADING MANUFACTURERS OF WATER CONDITIONING AND WASTE TREATING EQUIPMENT

When you need special information—consult READERS' SERVICE DEPT. on pages 79-83.

CHECK THESE FACTS ON DORR CLARIFIER PERFORMANCE!

OPERATING DATA DORR SIFEED CLARIFIERS—RADIAL FLOW—ROUND OR SQUARE

Location	No. Yrs.	Data Period	Ave. Flow MGD	Clarifiers No.	Clarifiers Size	Clarifiers W.D.	Det. Hrs.	O'Flow Gal.	Susp. Solids Raw	Susp. Solids Eff.	Susp. Solids % Rem.	Sludge % Sol.	Sludge % VM	B.O.D. Raw	B.O.D. Eff.	B.O.D. % Rem.
Washington, Blue Plains Plt.	2	1944-45	136.3	12	106' Dia.	14	1.88	1350	163	83	49	8.05	67.5	173	120	30.5
Gary, Ind.	4	1941-44	20.11	4	75' Sq.	10	2.0	900	265	104	61	5.32	63	148	72	47.2
Winnipeg, Man.	2	1943-44	22.8	2	115' Dia.	12	1.98	1100	348	159	55	9.0	70.5	310	231	25.5
Battle Creek, Mich.	5	1938-42	4.92	2	80' Dia.	10	3.66	490	282	85	70	5.5	82.5	264	174	34.1
Buffalo, N. Y.	3	1939-41	135	4	160' "	15	1.6	1090	209	114	46	5.77	59	138	107	22.5
Albuquerque, N. M.	7	1939-46	5	1	80' "	12.2	2.21	995	254	91	61	3.90	81	282	150	44.5
Yakima, Wash.	1	1942	9.5	4	90' "	9	4.32	373	110	23	74	6.98	74.4	175	92	50
Appleton, Wis.	7	1938-45	4.8	2	70' "	10	2.90	623	276	63	77	5.6	58	284	141	50
Baltimore, Md.	4	1939-44	89.5	3	170' "	12	1.84	1380	214	83	61	3.9	82.7	281	204	27.5
Springfield, Ohio	4	1937-40	14.8	2	90' "	10	1.55	1160	166	63	62	—	—	90	43	52
Mansfield, Ohio	2	1944-45	3	1	65' "	12	2.38	905	208	87	58	4.2	76	227	139	38.8
Cedar Rapids, Ia.	9	1936-44	4.21	1	70' "	11.5	1.95	1060	354	132	63	5.5	81.2	383	291	24
Austin, Texas	2	1944-45	5.84	1	75' "	12	1.69	1275	263	95	64	4.0	83	285	152	46.3
Neenah-Menasha, Wis.	4	1942-45	7.93	2	75' "	10	1.0	1790	681	188	72	—	—	—	—	—
Denver, Colo.	5	1939-43	46	4	140' "	9.7	2.34	750	187	44	77	5.4	76	212	108	49
Sheboygan, Wis.	1	1944	6.4	2	80' "	10'	2.8	635	342	60	82	7.2	81.1	513	285	44
Ypsilanti, Mich.	3	1943-45	1.66	2	40' "	9	2.5	660	226	87	62	8.2	71.4	141	95	33
Monroe, Mich.	8	1938-46	4.3	2	85' "	7.5	3.55	378	329	75	77	5.23	67.7	135	73	46

A few moments study of these figures will give you a clear idea of what kind of performance you can expect Dorr Clarifiers to deliver.

These are long-term records... obtained by competent plant chemists at well established installations. We believe they cannot be bettered.

Performance is one of the primary factors upon which Clarifier excellence should be judged. Are you getting the best?

Close-up of peripheral overflow from one of four 160' dia. Dorr Sifeed Clarifiers at Buffalo, N. Y.

•

We'd like to give you some figures on Dorr Clarifier repair costs too. Ask a Dorr engineer for the facts.

DORRCO

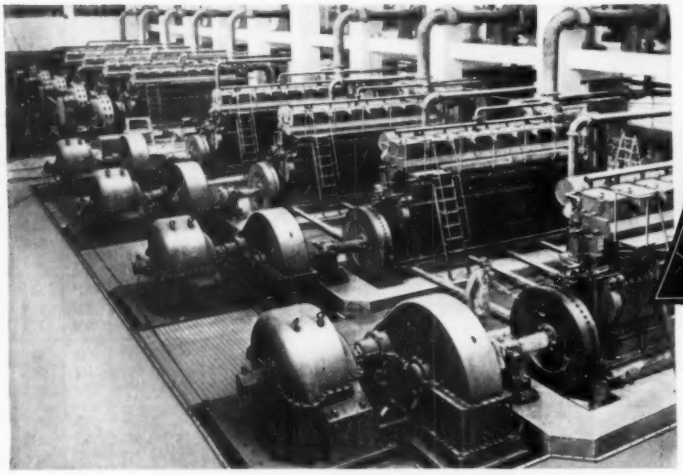
THE DORR COMPANY, ENGINEERS
BARRY PLACE, STAMFORD, CONN.
NEW YORK • ATLANTA • TORONTO
CHICAGO • DENVER • LOS ANGELES
RESEARCH AND TESTING LABORATORIES
WESTPORT, CONN.
SUGAR PROCESSING
PETREE & DORR DIVISION, STAMFORD, CONN.
ASSOCIATES AND REPRESENTATIVES
Dorr Technical Services and Equipment Are Also Available Through Associated Companies and Representatives in the Principal Cities of the World. Names and Addresses on Request.

DORR

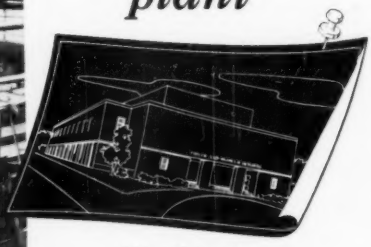
RESEARCH ENGINEERING EQUIPMENT

When writing, we will appreciate your mentioning PUBLIC WORKS

EXCEPTIONAL LOW POWER COST for huge new Los Angeles sewage disposal plant



Nine Supercharged, Dual Fuel Worthington Engines, of 1688 hp each, installed at the new Hyperion Sewage Treatment Plant, Los Angeles, California



Worthington Supercharged Dual Fuel Engines to Supply 15,000 hp . . . for only the cost of pilot fuel!

Now being built at a cost of approximately $41 million, Los Angeles' new Hyperion sewage disposal plant will be the most modern and efficient in the world. Designed to handle an average daily flow of 245 million gallons of raw sewage, this modern "high-rate" plant will feature the most advanced engineering in every detail of operation.

Nine Worthington Dual Fuel engines are to be the entire power source. Five will drive generators, and the other four will drive blowers. The Hyperion plant will operate at exceptionally low cost, thanks to: (1) the Worthington-pioneered dual fuel principle, permitting the use of gas, oil, or gas and oil in any ratio; (2) supercharging, which provides maximum power for available space, and with the utilization of high-temperature water cooling and exhaust heat recovery system, results in highest thermal efficiency.

SEWAGE GAS THE FUEL

These Worthington engines will normally run on raw sewage gas, utilizing pilot oil to ignite the gas. *Fuel expenses under ordinary conditions, therefore, will be only the cost of pilot oil.* However, should there ever be a shortage of sewage gas, the engines will automatically shift to oil fuel, in the necessary ratio. This gas-oil ratio can also be controlled manually.

FOR EVERY SIZE OF PLANT

In addition to Dual Fuel Engines, Worthington makes a wide range of Diesels, pumps, comminutors, and other equipment, to meet the requirements of sewage treatment plants of every size from the smallest to the largest. For further facts on the trouble-free, cost-saving engine performance that proves *there's more worth in Worthington*, write to *Worthington Pump and Machinery Corporation, Engine Division, Buffalo, N. Y.*

WORTHINGTON

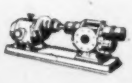
EO-1

YOUR PARTNER IN POWER PROGRESS

Diesel engines, 150 to 3,520 hp . . . gas engines, 175 to 3,520 hp . . . dual fuel engines, 225 to 3,290 hp.

WORTHINGTON-BUILT AUXILIARIES

Balanced Angle Compressors



Oil Transfer Pumps

Cooling Water Circulating Pumps

Evaporative Type Engine Water Cooler

When you need special information—consult READERS' SERVICE DEPT. on pages 79-83

CLAY...

RAW STUFF OF THE *Only* CORROSION-RESISTANT PIPE

Vitrified Clay Pipe is the only pipe offering complete protection against acids, alkalies, and chemicals. Proof? *There is no instance on record where a single length of Clay Pipe has ever worn out due to the action of a disintegrating agent.* This explains why 89% of America's sewerage lines are made of Vitrified Clay Pipe. On any sewerage or drainage project, be *sure* by specifying Vitrified Clay.

NATIONAL CLAY PIPE MANUFACTURERS, INC.

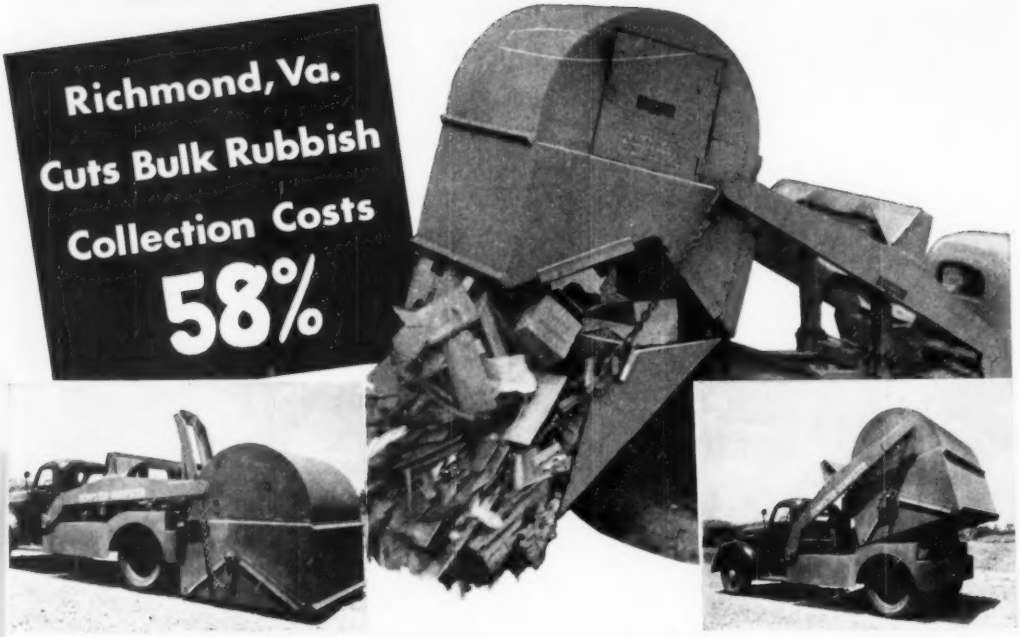
1105 Huntington Bank Bldg., Columbus 15, Ohio
703 Ninth & Hill Bldg., Los Angeles 15, Calif.
100 N. LaSalle St., Rm. 2100, Chicago 2, Ill.
206 Connally Bldg., Atlanta 3, Ga.

SPECIFY *Vitrified* **CLAY PIPE**

CLAY PIPE FITTINGS | PERFORATED CLAY PIPE | STANDARD-STRENGTH CLAY PIPE

C-150-3

Richmond, Va. Cuts Bulk Rubbish Collection Costs 58%



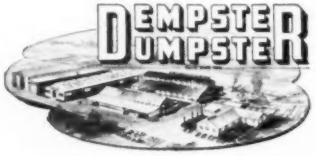
. . . 196 Dempster-Dumpster Containers Spotted Throughout the Business Area Did the Job!

When the City of Richmond, Va. replaced their conventional open truck method of bulk rubbish collection in the business area with the Dempster-Dumpster System, it cut collection costs from $1.02 to .43 a cubic yard. From the first day the 196 Dempster-Dumpster containers were spotted at various business houses, as well as schools, apartments and hospitals, tremendous savings and amazing efficiency were evident. Six truck-mounted Dempster-Dumpsters with only one man each, the driver, service these containers, making scheduled rounds picking-up, hauling and dumping one pre-loaded container after another. The tightly closed steel containers, ranging from 6 to 12 cu. yds., eliminated objectionable odors, rats, and stopped trash and rubbish from being littered over streets and alleys by winds and scavengers.

This new system got the immediate and enthusiastic support of the local business people. Some 30 letters were received by the city during the first 60 days of service commending the Department of Public Works for installation of the Dempster-Dumpster System. The following are typical comments of the people:

"We can sincerely say that this is the finest service ever rendered us by the City Refuse Collection Dept. We can recommend this service to anyone who wants to get rid of trash in the most economical way. We are delighted with the Dempster-Dumpster System and would not return to the old method of refuse collection under any circumstance. . . . This equipment has come up to our expectations 100%. We have placed orders for 6 more containers."

The Dempster-Dumpster principle—quick pick-up of containers pre-loaded by users—is applied not only in business areas, at hospitals, schools and apartments, but wherever bulk refuse accumulates . . . including market and housing areas . . . and at tremendous savings! Pick-up, hauling, and dumping action is shown in the photos above. Write today for "What They Think of the Dempster-Dumpster in Richmond, Va." The Dempster-Dumpster is another product of Dempster Brothers, Inc.



One Dempster-Dumpster Services All Containers . . . All Designs . . . All Sizes

DEMPSTER BROTHERS, 970 Dempster Building, Knoxville 17, Tennessee

When you need special information—consult READERS' SERVICE DEPT. on pages 79-83.

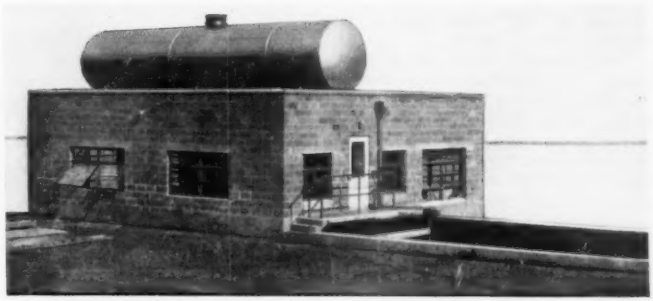
PUBLIC WORKS MAGAZINE
JULY • 1950
VOL. 81 NO. 7

SEMI-AUTOMATIC FILTER PLANT serves CARMICHAELS

EDWARD T. DAVIS and
ALFRED E. BAILY
THE CHESTER ENGINEERS

CARMICHAELS is one of many small communities in the coal mining district of southwestern Pennsylvania which has been faced with increasing population and decreasing water supplies. A municipal water system had served the Borough since 1938, water being obtained from deep wells drilled in the surrounding territory. The system was taken over by a Water Authority in June, 1947, in order to provide a method of financing the necessary expansion. The supply obtainable from the wells had been decreasing steadily; and, more recently, had been placed in serious jeopardy as mining operations approached the well field.

Since the supply had become insufficient for the present consumers and many additional consumers could be served if enough water were available, a study was made to determine possible remedies. For this study The Chester Engineers of Pittsburgh, Pa., was retained. Consideration was given to increasing the number of wells, to the construction of an impounding reservoir, and to enlarging a small government owned treatment plant and building a raw water pumping station at the nearby Monongahela River. All of these alternatives were found to have deficiences or lacked assurance of providing a continuous supply. Therefore, a complete filtration plant and pumping station were constructed at the river and 13,000 feet of 8-inch cement lined cast iron main was laid from the plant to the existing mains in the town. The pipe was supplied by the U. S. Pipe and Foundry Company. The plant has an average capacity of 500,000 gfd. and a maximum output of 750,000 gpd if run at 50% over the rated capacity of 2 gallons per square foot per minute filter rate.



● ***FILTRATION plant has design capacity of 0.5 mgd. Water is taken from the river. Tank for filter wash water is on top of the plant.***

A 125,000-gallon standpipe used in the original municipal system was incorporated in the new system. Its storage represents the average daily consumption, at present, during the summer months. From this it can be seen that the new plant has sufficient capacity to take care of a large population increase and also of the fire demand.

The Filtration Plant

The filtration plant consists of a raw water intake well; a 15,000-gallon concrete mixing chamber; a 71,000-gallon concrete sedimentation basin; two rapid sand open gravity filters each having an area of 90 square feet; and a 10,000-gallon concrete clear well. A 10,000-gallon cylindrical steel wash water tank is located above the roof of the plant.

The raw water intake well is located under the basement floor with its bottom 28 feet below this floor and 10 feet below the mean low water level of the river. Water flows into the well through a 12-inch wrought iron intake line. This intake line was bored into the well from a point near the river where shallow excavation could be obtained by means of a Young boring machine; and was then extended from this point out into the river with the underwater connections made by a diver. The river end of the line consists of 12 feet of cast iron pipe perforated with approximately 100 2-inch holes, anchored to prevent flotation, and surrounded with large rocks and gravel.

An economical intake well was constructed by excavating inside sections of 6-foot concrete pipe and sinking them as a caisson. An "orange peel" bucket was used for this and, except for some rock encountered near the bottom of the well, very little hand excavation was required. A reinforced concrete bottom was then poured in the well.

The Pumping System

The Fairbanks-Morse raw water turbine pumps, with capacities of 260 gpm. and 360 gpm. respectively,

are located in the basement of the main building with their columns vertical. This reduced initial construction and later maintenance costs materially as compared to the possible alternatives of building a separate raw water pump house or locating the intake well outside the plant and inclining the pump shafts into it.

The basement floor is below flood stage of the river so the intake well had to be sealed to prevent flooding. To accomplish this the basement floor was poured across the intake well and a watertight manhole placed above the well for access to it. The pump columns were adequately sealed where they pass through the floor. Provision was made for filling the intake well from the sedimentation basin and mixing chamber and flushing the strainer of the intake line if it should become clogged.

The basement serves as a pipe gallery room and high service pump station in addition to being the raw water pump room. The two high service pumps are Fairbanks-Morse two stage centrifugal pumps having capacities of 250 and 350 gpm, respectively when pumping against an average head of 475 feet. The electrical control center, manufactured by Westinghouse Electric Company, is also located in the basement.

The filters are located on the main floor which serves as the operating room. The underdrains were supplied by F. B. Leopold and Company. The filter media consists of 10" of Cape May gravel supporting 30" of Anthrafilt. The rate controllers and "rate and loss" gauges were supplied by the Simplex Valve and Meter Company.

The mixing chamber is of the mechanical type having a detention time of 44 minutes. The two chemical dry feed machines, soda ash solution feed machine and paddle mixer assembly were supplied by F. B. Leopold and Company.

A Wallace-Tiernan chlorinator is used for sterilization. It is connected for either pre-chlorination, post-chlorination, or a combination of each. A Simplex flow meter for the high service pump discharge and Bristol level gauges for the clear well and wash water tank are mounted on a gage board in the operating room. The plant is heated by an oil fired hot air furnace.

Operation is Semi-Automatic

The entire plant was designed for semi-automatic operation in order to reduce operating costs. In this connection, a Clayton altitude valve was installed in the existing riser at the standpipe to prevent overflowing and to shut down the high service pumps. Clayton float control valves were placed in the filter effluent lines to prevent the rapid sand filters from ever going dry. All pumps are automatically controlled except that the two high service pumps must be started by hand at the present time. The entire plant will shut down when the standpipe, clear well, mixing chamber, and sedimentation basin are filled.

The general contractor was Latrobe Construction Company of Latrobe, Pa.; the pipe line contractor was Frank Kukurin & Sons of Wilmerding, Pa.; the electrical contractor was Willis & Davidson of Carmichaels, Penna., and the heating was done by the Authority's own forces.

Blair & Company, Inc., associated with Arthurs, Lestrange and Klima were the fiscal agents in the handling of the financing of the project which required the sale of a total of $200,000 in bonds.

Alfred Armstrong, President; G. E. Robinson, Vice President; G. Wilbur Keister, Secretary; Richard L. Baily, Treasurer; and J. Claude Smith, General Manager, were the members of the Authority Board who served during the period of financing and construction.

Photo by Valo

THIS VIEW shows two of the three 135-ft. diameter low rate filters which provide secondary treatment for Ames, Iowa.

MODERN SEWAGE TREATMENT PLANT FOR AMES

A MODERN sewage treatment plant, providing complete treatment of the sewage from the city of Ames, Ia., and Iowa State College, has recently been completed and placed in operation. The plant was designed by Howard R. Green Co., consulting engineers of Cedar Rapids, of which Charles R. Mullinex is chief sanitary engineer. The plant, which cost approximately $1,000,000 was built by Lippert Construction Co. of Boone, Iowa, general contractors.

The plant will serve a population of approximately 27,000 population, with an expected dry-weather flow of 2.4 mgd. Because of low seasonal flows in the receiving stream, a highly nitrified effluent containing less than 25 ppm BOD was desired. The plant units include comminutors, grit removal, aeration, primary sedimentation, low rate trickling filters, secondary settling, chlorination with a chlorine contact tank, heated sludge digestion, and sludge drying beds. Sludge gas is being utilized to produce a major part of the power and heating requirements for the new plant.

There are three low rate filters, each 135 ft. in diameter, using vitrified clay filter underdrains. It is expected that, with probable loadings, the effluent BOD will be less than 25 ppm.

In the design of the plant, which was sponsored jointly by the city of Ames and Iowa State College, particular consideration was given to the desirability of providing flexibility in operation so that it would afford fullest facilities for training and experimentation by the sanitary engineering students of the College.

TEN YEARS *of municipal costs*

I. RUSSELL RIKER, C.E.

Engineer For Princeton Boro., N. J.

THE table herewith gives a comparison of unit costs for various municipal Public Works services in 1939 and in 1949. The units are in cost per million gallons, per ton, per square yard, per mile, and per person. For sewage treatment and incineration, the population includes Princeton Borough, Princeton Township, and Princeton University who receive such services. Other services are for the population of the Borough alone although the University and even the Township receive some benefit from these services.

It should be noted that the maintenance cost of all Public Works and buildings in 1948 was about the same as in 1939—$9.10 as opposed to $9.15 in 1939. This average maintenance cost jumped sharply in our budget for 1949. It should be noted that the minimum cost of $7.52 per capita occurred in 1945. It was at this time that materials and labor cost advanced rapidly.

Most of our unit costs have been kept down by new methods and new inventions. For instance, mechanical stoking has been installed at the incinerator and a heat exchanger for speeding up sludge digestion at the sewage treatment plant.

PUBLIC WORKS AND PUBLIC BUILDINGS

Unit Cost 1939—1948

	1939		1948	
	Unit Cost	Cost Per Capita	Unit Cost	Cost Per Capita
*Sewage Treatment & Pumping	$34.30 per mil. gal.	$1.21	$34.50 per mil. gal.	$1.20
*Incineration	.76 per ton	.29	1.53 per ton	.39
Garbage Collection Tin Cans and Bottles	3.75 per ton	.58	7.37 per ton	.76
Street Cleaning	7.54 per curb mi.	1.32	4.79 per curb mi.	1.40
Sewer Laterals	18.79 per mile	.14	22.36 per mile	.12
Street Patching	1.11 sq. yard	.82	1.50 sq. yard	.43
Street Surfacing	.09 sq. yard	.73	.12 sq. yard	.46
Traffic Painting	.04 per lin. ft.	.16	.08 per lin. ft.	.27
Street Signs	5.09 per sign	.15	13.51 per sign	.27
Catch Basins	.77 per basin	.08	1.41 per basin	.11
Snow Removal	4.17 per mile	.30	4.00 per mile	.22
Trees	.50 per tree	.25	1.07 per tree	.35
Playgrounds		.08	4.14 per child	.13
Parking Yard			1.66 per car space	.05
Street Lights	44.19 per light	2.03	36.12 per light	2.00
Public Buildings		.47		1.06

Note: Population Borough 1939 — 7,300
1948 — 9,200

**Population Served* 1939 — 13,900
1948 — 18,200

Municipal Sanitation Costs

The average citizen does not know much about the sewage treatment and pumping except that it is expensive. The cost of $1.20 per person was about the same in 1939 as in 1948. This is very low compared to most municipalities.

Incineration cost has increased slightly but recent mechanical improvements will keep this down. Outstanding in low cost is our garbage, tin cans and bottle collection of $.76 per person or $3.18 per family per year. Those who contract to have their garbage and refuse taken away must realize that municipal collection effects a great saving. The cost of street cleaning is fairly high—$1.40 per person. This is partly due to the service which we render in the collection of leaves, over 3,000 cubic yards being collected each season. By the use of mechanical equipment we hope to lower this cost. A leaf loader or a sucker-up has recently been put in operation. The cost of maintaining our sewer collecting system—12¢ per person—is extremely low. Both street patching and street surfacing have been reduced to about half, due to the annual addition of new hard surfaces, principally through state aid. Traffic painting and street signs each cost 27¢ per person. Here, we find a big increase due to the number of traffic and parking restrictions.

There has been little increased cost in the cleaning of catch basins; the same applies to snow removal, although a year with heavy snow fall may increase the cost per capita far beyond the average. The cost per person for maintaining our more than 3,000 trees along the streets is now 35¢, a slight increase. The cost of maintaining playgrounds has increased per capita; the same applies to public buildings which received few repairs during the war years. The largest per person cost is street lights—$2.00 per person or an average of $36.12 per light per year.

We are proud of these unit cost figures and feel that they compare

(*Continued on page* 52)

Repairing the MISSIONARY RIDGE TUNNEL

L. P. HOGE

Resident Engineer
Tennessee State Highway Department

AN interesting tunnel repair job has been completed at Chattanooga. Shifting soils had caused cracking of the original linings of the tunnels under Missionary Ridge. As a result in November, 1948, a large section of the concrete roof in the south tube, weighing a ton and a half, dropped a few inches and had to be removed. Traffic was diverted to the north tube. Traffic from that tube was then detoured over the ridge to reach the city.

The north tube had a constriction or reduction in cross-section at one point which required trucks more than 10 feet high to be detoured. In the interests of traffic safety, the present repairs were deemed advisable.

Known as the Bachman Tunnel, and now one of the principal outlets to the east and southeast for State Route 8 and U. S. Route 41, this twin-tube structure had been built by contract for Hamilton County and opened to traffic in 1929. Each tube is 1027 feet long, 20 feet wide and 16 feet high at the center, being semicircular in cross-section above the spring line. Each tube has a 3-foot raised walkway over a box-type drain on the right side. The walls and ceiling are of gravity concrete and there is a 17-foot concrete roadway.

This tunnel was driven through the solid rock of famous Missionary Ridge, except for about 100 feet at each end and a section about 80 feet long near the center consisting of chert and clay. During construction of the north tube, pressure on the timber supports caused the roof and side walls to settle 3 feet just after the concrete was poured. To strengthen this section a 12-inch layer of reinforced concrete was placed under it. Ever since the tunnel was opened to traffic, this section has been a hazard to trailer trucks, many of the taller ones becoming wedged in it.

After studies were made by the State Highway Department, it was decided that the condition of the south tube with its cracked ceiling was too dangerous to traffic. Plans were drawn and bids taken for repairs early in 1949. The project was awarded to the low bidder, the Atlanta Construction Department of Armco Drainage & Metal Products, Inc., for $220,834.75.

Making the Repairs

Beginning with the badly cracked south tube, several sections of broken pavement in the bottom were removed and replaced with 10-inch concrete pavement. All cracks, joints and bad places in the sidewalls and top were chipped and cleaned out. The old sidewalk slabs and support walls were removed and repoured.

Main repairs consisted of relining the entire south tube with 3-gage Armco corrugated steel tunnel liner plates; filling all voids behind the old concrete walls as well as between the walls and steel liner; and placing a gunite concrete lining over the steel plates. Steel base channels were set in concrete at each side of the tube to support the liner plates. Several of the liner plates (18 inches wide) were bolted together on the floor of the tunnel and then lifted into place by a small tractor crane and bolted to the preceding plates. A crew of 8 men erected an average of 27 rings in an 8-hour day.

Holes were cut in the liner plates at 10-foot intervals up to the spring line to permit a grout of one part cement to two parts sand by volume to be pressure pumped between the old tunnel surface and the steel liner plate.

Next, 2-inch holes were drilled through the grout and old concrete on 6-foot centers just above the roadway and the sidewalk; and $1\frac{1}{2}$-inch holes were drilled through the concrete ceiling on 10-foot centers. Pipes were then inserted to remain as drains. Whenever possible, a mixture of one part cement to four parts clay by volume was made into a slurry (liquid mud) and pressure-pumped through these holes to fill any voids existing behind the old tunnel walls.

Then, a 3 by 3-inch 10-pound steel wire mesh was welded to the surface of the steel liner plate, over which a gunite surface one inch thick was blown. It consisted of 1 part cement to $3\frac{1}{2}$ parts sand by volume.

Finally the precast sidewalk slabs were replaced, the hand rail cleaned and painted, and the south tube was opened to east-bound traffic last December.

Repairing the North Tube

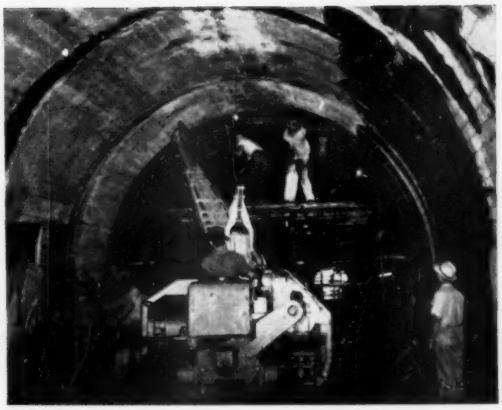
On completion of the south tube, the north one was closed to traffic to permit making necessary repairs. Joints and cracks were all chipped and patched with neat cement applied under pressure. As in the south tube, holes were drilled through the old concrete sidewalls and ceiling for pumping cement and mud into any voids behind the old tunnel and then to serve as permanent drains. These holes also aided the contractor in determining the extent of the voids and character of the soil around these sections of the tunnel. Broken sections of pavement in the bottom were removed and replaced.

The major repairs consisted of removing the constriction—the 80-foot section where the ceiling was too low. This was done as follows. Sections of concrete lining were removed a bit at a time and 8-inch, 34.3-pound steel H-beams, were placed as support ribs or rings around the tunnel on 2-foot centers. Lagging of 4 by 8 and 4 by 12-inch timbers was placed behind these ribs to hold the soil in place. Inside wall forms were then set and a 2-foot thickness of reinforced concrete placed to encase the steel H-beams.

Surveys, plans and supervision of construction were by the Tennessee State Highway Department. S. M. Squires is state highway engineer, O. F. Goetz is state construction engineer, H. O. Boyd is division engineer at Chattanooga, and L. P. Hoge was resident engineer.

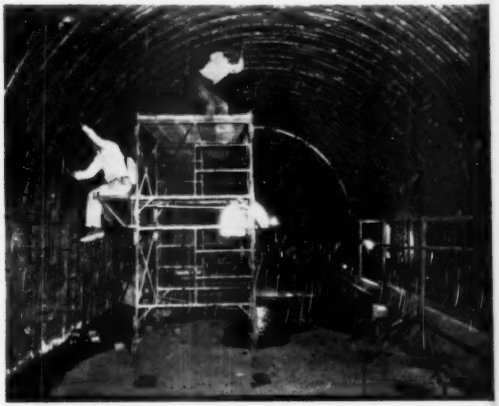
The contractor was the Construction Department of Armco Drainage & Metal Products, Inc., Atlanta, Georgia, with W. I. Floyd as general superintendent and B. J. Lamb as superintendent on the job.

● ***FIRST** step in lining: Pre-assembling 3-gage corrugated steel liner plates for placing.*



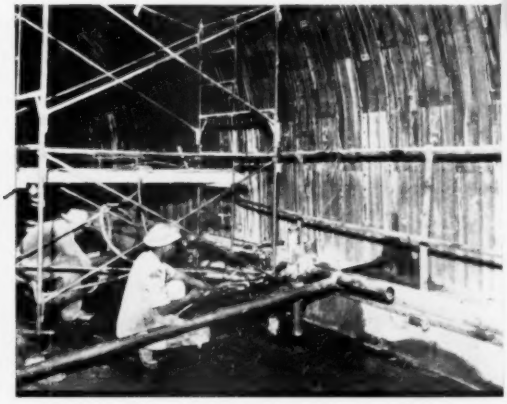
● ***SECOND** step: The pre-assembled rings are lifted into place with a small tractor crane.*

● ***THIRD** step: Men on scaffold, shown in second photo, ease plates into place and set the bolts.*



● ***FOURTH** step: After the liner plates have been placed, each bolt is checked for tightness.*

● ***FIFTH** step: The lining has been placed and grout holes are being drilled on 6-ft. centers.*



● ***SIXTH** step: Grouting behind liner plates was followed by guniting surface over mesh.*

A MUNICIPAL PLAN

PAUL VAN CAMP
Consulting Engineer

THE facilities recently completed at Whiteville, N. C., were the result of a municipal post-war plan formulated in 1945. Whiteville, like many other small towns, had experienced a rapid growth since 1939 with no material addition to its municipal facilities, and the town officials felt that a general study of their needs and of their ability to finance these needs, was necessary as a guide to their future. The mechanics of the preparation of such a plan will be described in some detail.

The foundation of such a plan is, first, a base map of the town and surrounding developed areas. This map will show streets and will indicate whether they are actually opened up or are merely "paper" streets. It will also show houses and other buildings as an indication of the amount of development in each area and the need for the various types of municipal facilities. Contours are useful to show the shape and drainage of the land surface. This basic information is needed whether the problem be water lines, sewers, paving, sidewalks, zoning, or other features of the plan.

Making the Base Map

This base map can be reproduced by lithoprinting or other process to give a number of prints on tracing cloth. On each of these there can then be developed a study of one of the above features, that is, one for water lines, one for sewers, etc. In making up a specific map it will first be necessary to indicate existing facilities. Much of this information is available in most towns, partly in more or less uncoordinated maps and partly in the minds of some of its employees or officials; but to have it available in compact form where it can be readily referred to, particularly by persons recently elected or employed is in itself of great value. The proposed extensions and additions can be shown by a different type of line. These maps, applying to each separate feature of the plan, can then be lithoprinted or photostated. This will permit reduction in size so they can be bound, together with descriptive material and estimates of cost, into a convenient volume which makes them readily available for reference. At all stages of its preparation such a plan should be subject to study, criticisms and suggestions by those who are responsible for planning the community and are familiar with its needs. Thus, its final condition is the result of the combined judgment of them all.

● ***CONCRETE walks and steps connect the plant units.***

Another factor which should be included in such planning is a study of the town's financial structure and the effect of proposed improvements on its tax rate and other financial setups. This can consist of a series of charts showing curves for the past ten years or more and projecting these into the future. This material is usually available in a town auditor's annual reports.

Shown below, so as to indicate its scope, are the chapter headings of the Whiteville plan.

I. Purpose of Report.
II. History and Growth of Community.
III. Water Supply.
IV. Sewage and Waste Disposal.
V. Streets, Sidewalks, Storm Drainage, Etc.
VI. Public Buildings—Recreational Facilities.
VII. Real Estate and Building Development.
VIII. Relation to Areas Beyond City Limits.
IX. Zoning, Building Code, Planting, Schools, Airports.
X. Municipal Finances.
XI. Summary.

The "Purpose of the Report" is described as "to provide for the orderly and rational development of the community facilities." This gives the justification for planning in a very few words.

Under "History and Growth of Community" the background for the growth of the town is given and suggestions are made for factors leading to additional growth. A population curve shows the growth by decades as follows: 1920—1,650; 1930—2,250; 1940—3,100; 1950—estimated 3,800. On one tracing of the base map is shown the boundaries of the various real estate subdivisions with the book and page number and

FOR A SMALL CITY

date of filing in the County Register of Deeds Office. The titles of the other chapters are self explanatory.

Under the heading "Summary" the following projects were recommended:

1st year—Sewerage Improvement and City Hall.

2nd year—Water System Improvements.

3rd year—Street Improvements, Sidewalks, Curb and Gutter.

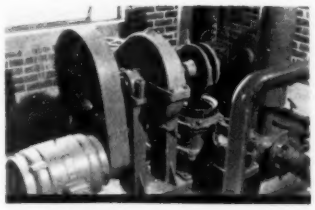
4th year—Park and Playground Facilities.

5th year—Farmers' Waiting Rooms, Produce Exchange, etc.

6th year—Additional Water and Sewer Facilities.

This program has been followed substantially as shown, but due to increasing prices, some of these projects (the storm sewers, the City Hall and some of the street work) have had to be deferred. The water and sewer projects involving a bond issue of $350,000 have been completed. Some of the street work has been done by assessment to abutting property owners. A part of the storm sewer work has been done from current funds, but the balance of this work is badly needed and will probably be undertaken soon. The town has also purchased the site for a new City Hall.

After the plan was approved, the town applied to the Bureau of Community Facilities for an advance with which to prepare detailed plans and specifications for the first projects. Where these funds are available, projects can be planned in detail before an election is held on the bond issue. Few small towns have adequate funds in their current budget to finance complete plans and specifications. Since many changes from the original report always develop in the preparation of these detailed plans and specifications, it is a distinct advantage to have them prepared before the bond election. Also from the standpoint of financing, it is a great convenience to have this money included in the bond issue. Under North Carolina law it is as difficult for small towns to borrow money for planning as it is for the bond issue itself. When a federal advance for planning is obtained, all that is necessary is to send a check for the amount advanced after the bonds are sold; no other preliminary financing is necessary.



● ***ADJUSTABLE stroke sludge pump with time clock control.***

The Sewerage and Water Projects

The water project, now completed, consisted mostly of new water mains for reinforcing the grid system; for providing fire protection where none was available; and for furnishing domestic service to every residence within the town limits.

The former sewerage system consisted of 52,000 feet of sewer line leading to several septic tanks, all overloaded, which discharged into ditches at various points about the perimeter of the town. Due to the flat topography, many houses were too low to get into those lines. When the project was completed, the system comprised 103,000 feet of sewer—about twice the original amount.

The new project consisted of two large collecting lines designated as the East and West Outfall Lines which intercepted the flow to those septic tanks and, running in the lowest areas, provided an outlet for sewers built to serve all future development. Sewage from these outfalls is treated in a new sewage treatment plant built in Soul's Swamp, south of the town. This swamp is only a few feet lower than part of the built-up parts of the town. Hence a pumping station was built as a part of this plant which pumps the sewage from a wetwell into the settling tanks.

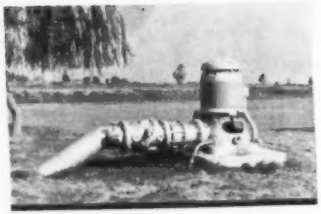
Preceding the wetwell the sewage passes through a Tritor screen which removes both grit and screenings at one operation. Since both of these materials are to be buried as a means of disposal, there is no advantage to having them removed separately.

The two settling tanks are conventional rectangular primary tanks each with two end hoppers and with Link-Belt collector mechanism. Provision is made for the addition of a single stage biofilter, secondary settling tanks and an additional drying bed at a later date. This primary settling is followed by

(*Continued on page* 59)

SMALL WATER

This is the second of a series of articles on small water supplies. The third, which will appear in the August issue, will discuss coagulation and settling.



● ***GROUND waters are important sources of supply for small community water plants.***

THE problems of the designer of small water plants are well stated by Dwight F. Metzler, Chief Engineer and Director of the Division of Sanitation of the Kansas State Board of Health, who says: "At the outset, the designer of the small water system is faced with the problem of planning a plant which will produce the quantity and quality of water necessary within the limits of the funds available." In the small plant, the very best of materials and equipment available should be used, the more so because it may be a long time before the community will have money for replacements if the original equipment is inadequate.

Ground Water Sources

In some parts of the country, ground water is available at depths and in quantities which are reliably known. In other sections, a ground water yield of satisfactory quantity and quality is questionable. In any case, the services of the most reliable and experienced well drilling organization available should be engaged at a very early date. A preliminary survey should be made and a report should be obtained from this organization before final selection of the source is made.

"We feel it is always desirable, though it may not always be possible, for a community to have at least 2 wells and a source of standby power" says B. A. Poole, Director of Environmental Sanitation for Indiana. Nearly all states require that the well site be properly protected from surface wash and flooding. Texas also requires that wells be at least 50 ft. distant from tile sewers or septic tanks and 150 ft. from cesspools and septic tank drain tile fields; and never on lower ground than such adjacent installations. Other precautions include provision of a satisfactory method of sewage disposal for use during drilling operations in order to prevent soil pollution.

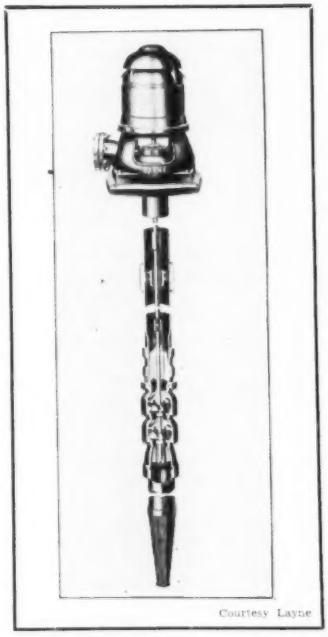
The wells should be properly cased, with casing joints of screw or welded type. The casing should extend 18 ins. above the finished floor and to a depth sufficient to cut off undersirable flow into the well. A concrete sealing block at least 6 ft. sq. surrounding the pipe should be provided as a top seal. The space between the casing and the drill hole should be sealed with cement mortar.

In constructing gravel-wall wells, the gravel should be washed with a chlorine rinse of 50 ppm residual chlorine as it is added to the well. The well, casing, screen and adjacent water bearing strata should be disinfected by introducing a disinfecting solution, usually chlorine, into the well under sufficient pressure to overcome the normal static pressure of the water and in sufficient quantity to maintain a chlorine residual after 15 minutes contact in the well.

Power Requirements

Unless adequate storage is available to meet all usual requirements, including fire reserves, standby power should be provided at the well if there is but one; or, if there are several wells, at enough of them to produce sufficient water in case of power failure or other breakdown. Either gasoline or diesel engines may be used. The former cost less initially but more to operate. However, for standby purposes, the former are suitable since they will operate only occasionally. If electric power is not available, and internal combustion engines are used as the regular source of power, diesels are likely to be more economical. In any case, whether for standby or for regular use, the best engines available should be installed. For standby use, the greatest reliability is needed, for when electric power fails, only the standby engine remains, and its failure at such a time would be a catastrophe.

The location and protection of wells to prevent contamination of the water they produce is a matter of much importance and the State Sanitary Engineer should be consulted. The requirements of most states are available in considerable detail. In this article only general directions have been given.



Courtesy Layne

● ***A COMMONLY used type of pump—the vertical turbine.***

Some states also have regulations regarding spacing of wells and amount of draw-down permissible.

In some areas, springs exist which may be developed for small water supplies. These should be protected by a housing, and by drainage structures to divert surface wash, as to make contamination impossible. The methods of doing this are often covered by State Board of Health regulations.

Treatment of ground waters will be discussed in a later article.

Surface Water Supplies

A watershed or drainage area, from which a surface water supply is drawn, requires a reasonable degree of protection against pollution.

SUPPLIES — SOURCES

In most cases the engineer's report, in addition to showing a map of the watershed. should cover not only typography, vegetation and soil characteristics, but also the number of inhabitants and the methods of waste disposal they use; the number of domestic animals; types of farming; industrial activity; and recreational use, as hunting, fishing or camping.

There are two schools of thought in regard to this general matter. One group feels that the purpose of treatment—sedimentation, filtration and chlorination—is to safeguard the water and, therefore, excessive precautions in regard to watershed sanitation are unnecessary. The other group is represented by the statement of the Texas Department of Health, which recommends "strict control of sanitary conditions on the watershed to protect the sanitary quality of the water, even though adequate treatment is provided."

In small plants having unskilled operation, there is need for strict control of the quality of the water coming to the plant. In any case, the matter will probably be decided by the regulations of the State Sanitary Engineer. Of course, where sedimentation and filtration are not provided, a protected watershed is a necessity, even though chlorination is faithfully practiced.

The yield of a watershed depends on many factors, of which the most important probably are the amount of rainfall, the character of the soil, and the proportion of the watershed area covered by water. In small watersheds having a storage lake—common in the northeastern states—the latter may be quite important.

There are several formulas for estimating the probable runoff from a watershed. Most of these appear to be based on conditions in the northeastern states and it is doubtful if they apply well in areas of much lower rainfall. Probably the simplest one is that by Vermuele:

$$F = R - (11 \times 0.29R)\ (0.035T - 0.65)$$

where F annual runoff in inches
R annual rainfall in inches
T annual temperature in degrees F.

In using such a formula even for a rough check on data obtained from other sources, it should be remembered that the minimum annual rainfall is likely to be only about 60% of the average. Therefore, unless very large storage is provided—not usually possible in a small system—computations should be based on the year of minimum rainfall.

Direct measurement of stream flow over a number of years forms the most reliable data, but such information is rarely available, and usually the engineer must form an approximate estimate on the basis of short-time flow records, data from neighboring areas having the same general conditions, and computations of the nature indicated above, based on the best available rainfall records.

Evaporation from water surfaces may be an important factor, especially in a small system where the reservoir area may be from 10 to 20 per cent of the watershed area. In the northeastern states evaporation may run to 40 ins. or about as much as the average rainfall and greater than the minimum rainfall. Moreover, most of this occurs during the May to Sept. period, when rainfall may be low. Generally evaporation will exceed rainfall in the summer months. It is a good rule to allow for half of the total evaporation in the northeast to occur in the period from May to August, inclusive.

There are probably inadequate data for evaporation in the southern states, though various records have been assembled. These show that in Texas evaporation totals over 60 ins. per year and amounts to 2 or 3 ins. per month in the winter and 6 to 9 ins. per month from May through September. In Birmingham, Ala., evaporation is perhaps 10% less than in Texas. Winter months losses are about the same, but the summer peaks are slightly lower. Monthly losses from April through September will average around 6 ins. per month.

Intakes and Screens

Most states require, to quote one of them, "appurtenances to guard against the entry of foreign materials, and facilities for cleaning or sluicing." On small supplies these may be simple and, unless the lake is deep and subject to considerable drawdown, the intake may draw from only one level—generally at least 4 or 5 ft. above the bottom and not less than that distance below the surface. The benefits of having drawoffs at different levels usually do not justify the costs in small

(*Continued on page 70*)

● ***RESERVOIRS provide storage and the water from them is apt to be partially clarified, but algae growths may cause tastes.***

KEEPING HIGHWAY MAINTENANCE EQUIPMENT IN CONDITION

by DELEMATER DAVIS, JR.

Highway Equipment Engineer, Virginia Department of Highways

This article describes the organization of the Virginia Highway Department whereby it insures getting the maximum service out of its multi-million dollar fleet of equipment.

FOR organization, the Virginia Department of Highways is divided into eight construction and maintenance districts, including some thirteen counties in each district. Our maintenance and construction program in Virginia covers 47,000 miles, of which over 9000 miles are in the primary system. District headquarters are located as near as possible in the center of the districts and in all cases near a railroad siding or large city.

Heading the highway forces in his area is the district engineer with an equipment superintendent to supervise the maintenance, overhaul, stock, and all other equipment functions within the district. In the larger districts, equipment replacement values are well over $1,000,000.

Each district is sub-divided into four to six residencies each having a resident engineer and resident mechanic. There are from two to four counties in the residencies with a county foreman or area superintendent responsible for the roads and equipment assigned to his particular county.

Mechanical forces under the general supervision of the district engineer are primarily concerned with what might be called the three echelons of maintenance. The Equipment Engineer and his division furnishes technical supervision to the district forces through distribution and inspection of equipment.

Three Maintenance Echelons

The first echelon of maintenance consists of servicing and minor repairs performed by the operators. The second echelon maintenance is performed in the resident shops by the resident mechanic and his helper and includes replacement or repair of major parts beyond the scope of the operators facilities and knowledge. The third echelon maintenance is performed in the district shops and consists of general overhauling and major repairs, machine work and carpenter work, welding, and all work requiring the facilities of a larger shop.

The equipment maintenance furnished by the operators is performed on a daily and weekly basis usually at the end of each week's work. The scope of this work requires only hand tools and grease guns furnished to the operator for his particular piece of equipment.

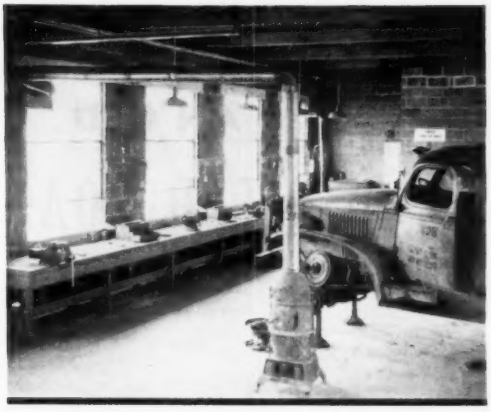
In general, the equipment maintenance done by the operator is under the supervision of his foreman or project mechanic and may be itemized as follows:

Before starting the equipment, the operator must be certain that it is mechanically and operationally safe for performing the work designated. He is always responsible for the condition of the equipment he is operating and that the following general items are in good working order prior to use:

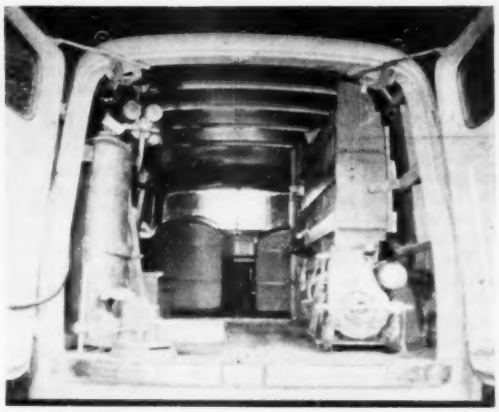
1) The equipment is clean.
2) Windshield and windows are clean.
3) Gas or fuel tank is full.
4) Radiator is full of clean water.
5) Oil in the crankcase is at the proper level.
6) Tires are inflated to the proper pressure and show no dangerous defects.
7) Windshield wiper is operating satisfactorily.
8) All lights are burning properly and lenses are clean.
9) Battery plates are covered by at least ¼ inch of water, but not overflowing.
10) Chains, tools, extra fuses, spare bulbs, fire extinguishers, First Aid Kit, flares, and "Men Working" signs are properly stored.
11) The horn is functioning properly.
12) Brakes, both foot and hand brake, are tested with the equipment in motion to insure proper operation, both empty and loaded.

Once each week the operator gives his equipment a thorough inspection which includes the following maintenance:

1) Thorough cleaning of chassis and motor, using water, if available, on the body and chassis, and cleaning compound on the engine. He must disconnect the battery while cleaning engine with any cleaning fluid.
2) Complete greasing of the equipment in the manner in which he has been instructed by the mechanic.



● ***INTERIOR** view of the Ashland Residency shop, a second echelon maintenance installation.*



● ***INTERIOR** view of mechanic's truck. Note power plant, welding equipment, vise, parts bin.*

3) Check and fill storage batteries with distilled water to ¼ inch over top of the battery plates. Battery terminals are kept cleaned, tight, and greased.
4) Fan belts are inspected for condition and proper tension. Slack of ¾ inch is allowable.
5) Drain and refill crankcase at proper intervals with the proper oil as instructed by the mechanic. Diesel engines require detergent heavy oil in the crankcase for efficient operation.
6) Transmission and differential checking while the equipment is warm. He adds only to the level of the fill plug. Drains, flushes, and refills at intervals as instructed by the mechanic.
7) Inspects for gas, oil, and water leaks, making all minor repairs possible.
8) Cleans air filter and refills with oil. (Cleans daily if working under dusty conditions.)
9) Replaces oil filter cartridges at intervals recommended by the mechanic, and at each oil change on Diesel equipment unless otherwise instructed.
10) Checks all lights, fuses, and wiring for satisfactory connections, replacing all defective lights and fuses.
11) Inspects and tightens all loose bolts, nuts, screws, etc., replacing all that are missing.
12) Inspects and lubricates all points designated by the mechanic and the manufacturer at the proper intervals and with the proper lubricant.
13) He does not attempt to make repairs on, or to replace any major unit unless working under the direct supervision of the mechanic.

The operator reports any difficulties which come up during the day to the resident mechanic who can readily determine the necessity for immediate repairs or whether the equipment should be scheduled for later repairs.

The backbone of equipment maintenance is the individual operators. The area foremen are responsible for the proper care and upkeep of their assigned equipment. Usually the repair facilities available for the operators are limited to his particular truck shed and tool kit, however, residency shops are generally located conveniently to all patrol, gang, and county headquarters.

Second Echelon Maintenance

At the second echelon maintenance level, the resident mechanic performs the repairs for which the operators do not have the tools or facilities, such as differential and transmission repairs, steering, engine repairs, generators, starters, distributor repairs or replacements.

He is often called to a job site where he may find a shovel, tractor, or pan which is in need of immediate repairs or welding, and he is sometimes called on for assistance in the repairs and upkeep of crusher installations. Since a resident mechanic has one or two helpers in his shop, assistance on the job does not hold up any work being performed in his shop.

Within the residency shop building is an air compressor, drill press, bench grinder, valve grinder, battery charger, hydraulic jacks, overhead hoist and welding equipment. His complete set of tools furnished by the department are ample to perform any repairs on his equipment from a major overhaul to a simple generator replacement.

The large assortment of tools necessary is due to the wide scope of work which may carry the residency mechanic to a project for equipment repairs that would not be practical for bringing into his small shop. The resident shops are in general, 24′ x 36′ with some of the later shops 36′ x 80′ in size. The "rolling shop" is a 1½-ton panel truck complete with acetylene welding equipment, vise, tools, lubricating equipment, and spare parts necessary for routine and some special repairs. A 1500-watt electric generating plant is installed in the truck to operate lights, electric drills and grinders.

Third Echelon Maintenance

The district shop represents the third echelon of maintenance in the Equipment Division Organization and is the hub of the equipment activities within the district. This shop is generally located a short distance from the district engineer's office in order that close coordination may be maintained between the district engineer and his equipment shop superintendent.

The stock room is generally located so that an issue window is open to the shop. All parts, tools, replacement parts, and assemblies are stored for the adjacent district shop and the residency shops. The storekeeper is well versed in the requirements of his particular district and works directly under the equipment shop superintendent.

In the shop, the foreman supervises approximately thirty mechanics, machinists, carpenters, blacksmiths, painters, and sheet metal workers. Each of these classes of district shop employees have all the necessary equipment and tools with which to perform work of major overhauling or complete rebuilding of equipment when required. He works under the direct supervision of the equipment shop superintendent.

The shop foreman's day often takes him into the field to supervise heavy repairs on crusher installations, and in some cases, to assist in bridge erections, snow removal, or any general emergency conditions where an additional foreman is required. In such cases the shop foreman assists the regularly assigned area project or county superintendent.

Preventive maintenance is limited to the equipment operators working under their immediate superintendent or foreman. The residency shops assist in preventive maintenance by furnishing mechanics who inspect equipment on the job and make such repairs as necessary to keep the equipment in good operating condition.

The District Shops

The district shop has equipment overhauling and major repair facilities for the district, and a stock of the major parts and equipment necessary to repair the many types of maintenance equipment operated by the Highway Department.

The district shops are considerably larger than the resident shops, usually about 60′ x 100′ in shop area. The office section is adjacent to the shop and there all records for the district are kept covering equipment maintenance, repairs, and overhaul.

In Richmond, the central equipment depot for the State backs up the district equipment program through processing and preparing new equipment for the field forces, manufacturing and overhauling such equipment that the district shops are not capable of performing.

The Equipment Depot is, of course, a large building with many thousands of feet of floor space for equipment repairs, stock and storage.

Equipment maintenance is kept at a high level of operating efficiency through close coordination and harmony between the district forces and the equipment division. Continuous schools are conducted in the eight districts to improve the older operators and indoctrinate the newer ones in the required procedures of equipment upkeep and operation. Common problems are solved through the exchange of technical information throughout the state. By working together in a spirit of willingness, a tremendous task is performed with ease and regularity.

● ***TYPICAL floor plan for highway department residency shop.***

RECLAIMING AN OLD OILED ROAD

CARL LEMMER
Surveyor, Cascade Co., Mont.

WE reclaimed five miles of old oiled road by using a Seaman pulvi-mixer. The old oil mat was ripped up with a grader-scarifier, and windrowed. It was then pulverized with the Seaman mixer and relaid without the addition of any oil. It made a very good farm-to-market road. During 1949, we did much other work, which can be summarized as follows:

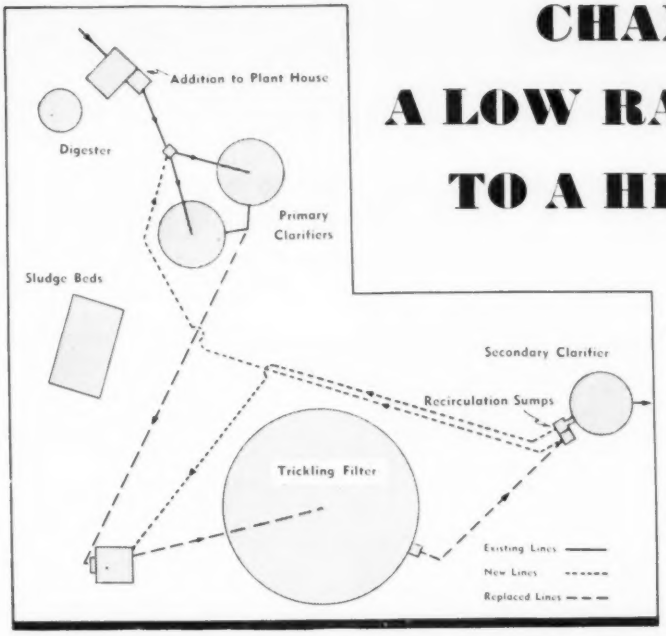
We elevated 24.0 miles of road, requiring 242,000 cu. yds. of excavation; graded 20.7 miles of road, involving 105,570 cu. yds. of dirt-moving; surfaced 30.55 miles of road with 35,972 cu. yds. of pit run gravel and 920 cu. yds. of crushed gravel; and oiled 8.30 miles of road. Maintenance operations were carried on over 1430.5 miles of road, including 56.0 miles of oiled roads, 464.5 miles of gravel and shale roads, 699.45 miles of dirt roads, and 210.55 miles of unimproved roads.

We crushed and stock-piled 10,794 cu. yds. of gravel for use in road surfacing in 1950. Other work included constructing and placing 1,272 ft. of wood culvert and placing 1,938 ft. of metal and 672 ft. of concrete culvert; repairing 26 bridges; painting 66 bridges; and constructing 75 miles of right-of-way fence; 20.65 miles of snow fence were put up in the fall and taken down in the spring.

The road construction program for 1950 will be about the same as for 1949.

Equipment operated by the county includes: 18 dump trucks; 22 pickup trucks; 3 heavy duty trucks; 1 transport truck, 35-ton capacity; 1 pile driver; 1 crushing plant; 1 welding machine; 6 tractors; 2 elevating graders; 7 pull-type graders; 9 motor graders; 1 power shovel; 1 concrete mixer; 3 portable compressors; 1 pulvimixer; 1 jeep with mower; 3 scrapers; 7 trailers; and 15 snow plows.

CHANGING A LOW RATE FILTER TO A HIGH RATE



● ***ESSENTIAL features of the Woodridge plant, as remodeled, are shown in this simplified layout. Good BOD reduction is obtained.***

UNSATISFACTORY results were being obtained in 1947 from the sewage treatment plant of the Village of Woodridge, N. Y. The plant, built about ten years previously, consisted of a manually cleaned bar screen and grit chamber; two circular settling tanks 30 ft. in diameter; a low rate trickling filter 93 ft. in diameter and 9 ft. deep; a 30-ft. diameter secondary settling tank; a 22-ft. diameter digester with the heating coils omitted; and a glass-covered sludge drying bed.

Woodridge is a summer resort, with a high population peak in July and August. A large laundry contributes its waste to the sewerage system. In the winter, this operates two or three days a week; in the summer it operates every day. There was no metering device on the plant and no flow data were available. It was estimated that the maximum summer flows were about 0.7 to 0.8 mgd, of which the laundry contributed about 20%. Winter flows were very much less and were relatively unimportant in design. In the reconstruction of the plant, a flow meter was installed. This indicates that the maximum summer flow is about 0.8 mgd; the winter flow without the laundry waste is 0.125 mgd; the laundry contributes about 0.10 mgd during winter operation and about 0.15 mgd in the summer. Grab samples taken during August, 1946, showed a probable raw sewage BOD of 380 ppm.

Overflow of the dosing tank occurred during several hours each day in July and August. Distribution to the trickling filter was poor. The secondary settling tank, which had been located in a swamp area, was canted so that the overflow weir on one side was about 6 ins. lower than on the opposite side. The concrete of the dosing tank and of the exposed portions of the secondary settling tank had decomposed severely. The effluent from the plant was so strong and discolored as to cause serious nuisance in the small lake into which it was discharged.

Planning Improvements

Olney Borden of Liberty, N. Y., was engaged as consultant for the improvement of the plant, and W. A. Hardenbergh of New York was associated in the design. The following program was determined on: (1) Reconstruct the dosing tank and lay a new feed line from the primary tanks to the dosing tank, and thence to the filter; (2) install a new distributor designed to handle flows up to 2.0 mgd; (3) install both primary and secondary recirculation; (4) reconstruct the above-ground portions of the secondary settling tank and install a new and level effluent weir; and (5) modify the operating building to provide office space and shower facilities for the operator.

The existing feed line from the primary tanks to the dosing tank was barely sufficient to carry peak flows, and during storm periods infiltration was such that the dosing tanks overflowed. This line was relaid, the existing 10-inch cast iron line being salvaged for later use in recirculation, due to the severe shortage of cast iron pipe at that time, and a new 14-inch Transite line installed. The dosing tank was entirely reconstructed, a new 15-inch siphon installed and the walls raised 6 ins.

The existing 8-inch cast iron feed line to the distributor was salvaged and a 14-inch Transite feed line was installed. A new distributor, furnished by Carter, was set on the filter.

Converting the Filter

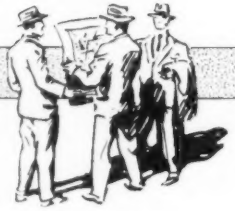
To convert the filter to high rate, it was planned, with the advice of R. S. Rankin of the Dorr Co., to recirculate 500 gpm of filter effluent to the primary settling tanks, and 250 gpm from the secondary settling tank to the dosing tank. Calculations of probable BOD strength of the effluent indicated an expected 26 ppm under most favorable conditions without taking account of the secondary recirculation. A maximum of 44 ppm in the effluent was possible under unfavorable conditions with the highest expected future loadings.

The line from the filter to the secondary settling tank was replaced with 14-inch Transite and a 500 gpm propeller type pump was installed in a small sump on this line. This pump discharges to the joint intake of the two primary settling tanks. Another sump was con-

(*Continued on page* 71)

PLANNED PUBLIC WORKS

FLOOD CONTROL



R. R. McINTOSH
Director of Public Works, Battle Creek, Mich.

THE City of Battle Creek, originally settled in 1831, is at the confluence of the Kalamazoo river and its tributary, the Battle Creek river. There has been a constant threat of flooding and periodically floods of minor and major magnitude have occurred.

The maximum flood of record at Battle Creek was in March, 1904, with floods of slightly less volume occurring in March, 1908, April, 1947, March, 1918, Mar, 1887, and March, 1948, in that decreasing order of peak discharge. A historian reports floods in 1854, 1864, 1868 and 1869 greater in magnitude than the 1904 and 1908 floods but actual stages are not available for these peaks. This historian reported that the flood of 1864 "probably contained the most water". Lesser floods have occurred at more frequent intervals with minor flooding in the lower areas occurring almost annually. With the exception of the flood in June, 1864, all of the major floods noted above occurred in the spring as a result of heavy spring rains on snow cover over ground in a fairly saturated condition and at a time when stream stages were already rising. The flood of 1947 reached an equivalent of 7,500 cubic feet per second and pictures of that flood accompany this article.

The City has developed along the banks of the two rivers, due to a cheap and abundant water supply. The result has been a crowding of the commercial and industrial sections of the city into the lowest part of the valleys, thus creating a considerable assessed valuation in the areas which are most subject to flood damage.

● ***SUBURBAN flood conditions.***

● ***BUSINESSES were flooded, creating many problems.***

Many people have given a great deal of thought and study to the matter of reducing the flood threat but the very fact that the industrial and commercial life of the city is crowded so closely to the banks of these rivers, with resultant encroachment, has presented physical and financial difficulties. As values of the properties involved increase, the relative importance of abating the flood threat not only becomes greater, but becomes more difficult, because of the values which it threatens to destroy.

Realizing that the matter of approaching the proper solution to the flood problems entailed a complete study of the Kalamazoo and Battle Creek river valleys in the vicinity, the City Commission recognized that outside aid would be required and requested a survey by the Board of Engineers for Rivers and Harbors. In compliance with a resolution of the Committee on Public Works of the U. S. Senate, adopted June 24, 1947, the Corps of Engineers, U. S. Army, made a survey of the flood problem affecting Battle Creek and vicinity. This survey has now been completed.

Flood Control Data

The District Engineer of the Corps of Engineers in Milwaukee, in his report, finds that a flood problem exists along the Kalamazoo river and its tributary the Battle Creek at the City of Battle Creek, and vicinity, and that floods larger than any that have occurred are probable. He estimates (1) that the flood which occurred in 1947 caused direct and indirect damages amounting to $785,408; (2) that a plan of flood protection designed safely to pass a flood equivalent of 11,000 cubic feet per second from the confluence of the Battle Creek and Kalamazoo rivers will eliminate 82% of the flood damage; and (3) that the cost of the work will be less than the benefits to be derived therefrom. He is, therefore, recommending that a flood control project at Battle Creek be constructed at an estimated first cost of approximately $3,000,000 with Federal participation, subject to certain specified conditions of local cooperation. It is expected that the total cost of the project, local and Federal, will amount to $5,250,000.

The community is now studying the results of the survey of the Corps of Engineers and particularly those sections of the report referring to the extent of local cooperation. It is believed that, from the joint study by the community and the Corps of Engineers, steps will soon be taken to eliminate most of the threat of floods which has prevailed since the settling of the city in the last century.

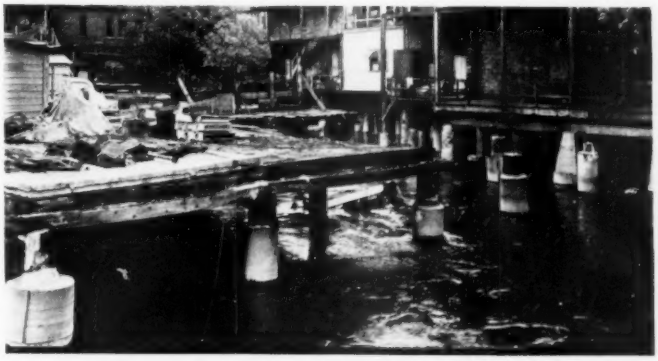
Meanwhile, local steps have been and are being taken, as far as facilities will permit, to eliminate some of the contributing factors to the floods of minor magnitude. These have included the building of small dikes along the lower and more often flooded areas; the installation of automatic swing gates on storm and sanitary sewer outlets discharging into the two rivers to prevent the backing up of flood waters into low, sewered areas; and the installation of a pumping station capable of pumping 3,200 gallons per minute in the lowest area which usually suffers flooding. This will promote fast disposal of the water after the flood peak has passed, while aiding in reduction of flooding in that area. One of the principal dams, which was in a weakened condition, has also been reinforced, and is now in good condition.

In the consideration of its flood problems the city has had the cooperation of the Water Resources Commission, set up by the Michigan legislature. The project has the full approval of this Commission, since it is evident that the flooding situation is of sufficient size and importance to support the request for assistance in meeting the financial difficulties involved.

In connection with the above view point, it might be stated that Battle Creek is also the main intersecting point for the two principal East-West railroads between Detroit and Chicago. These are the New York Central and the Grand Trunk Western Railroads. Both of these railroads could be so flooded that it would be impossible to maintain freight and passenger traffic.

The matter of public health is also involved since a part of the program calls for the connection of all sanitary sewer discharge lines, which have previously emptied into the two rivers, into an outfall sewer carrying the main portion of the city sewage to the sewage treatment plant owned and operated by the City of Battle Creek. The final solution of the flood program is still uncompleted in the present planning but the progress that has been made is so heartening that it appears closer than ever before.

● ***AERIAL view during flood, showing conditions in the industrial areas where great damage resulted.***



● ***CLUES to conditions that contributed to the severity of Battle Creek's floods. These are rather typical of the obstructions existing in Kalamazoo River. They are being removed.***

HOW EQUIPMENT IS USED EFFECTIVELY IN COUNTY HIGHWAY WORK

EQUIPMENT used effectively by Orange Co., Calif., H. Sprenger, Road Commissioner, include motor patrols, which were employed on roadside maintenance, backs'oping cuts and plant-mix laying. In San Joaquin Co., Calif., C. V. Jones, Deputy Road Com'r., a road mixing machine was used most effectively for both surface treatment and road mixing. A mobile truck and crane were used by Tulare Co., Calif., T. W. Switzer, County Surveyor. This unit was equipped as a clamshell, dragline and pile driver, and was used for wrecking old timber and concrete bridges and for placing concrete.

W. D. Hoffman, Road Supervisor, Elko Co., Nev., reports "last year we built about 15 miles of road and laid a crushed rock surface. In doing this we used track-type tractors, scrapers and motor graders most effectively. We also started using a new stone crusher. This was Elko's first rebuilding and re-alinement job, and it was also the first time we used a crushed rock surface; previously we used either pit run or river gravel." T. R. Hartrampf, Roadmaster of Washington Co., Oreg., uses an 8-yd. scraper for small grading jobs, and a power loader on ditch and shoulder work.

Ralph T. Knutzen, Whatcom County Engineer, Wash., used a 1949 model portable crusher to furnish aggregate for light bituminous surface treatments and seals. Okanogan Co., Wash., Howard M. Taylor, Road Engineer, "used six crawler tractors for heavy dirt moving, using both bulldozers and scrapers; also nine motor graders, which were used on both construction and maintenance. Other equipment used included two $\frac{3}{8}$-yd. and one $\frac{1}{2}$-yd. shovels and 20 dump trucks. In this county, with more than 1,500 miles of road and an income of less than $250 per mile, we find that the most economical use of equipment consists in using motor patrols, shovels and trucks to improve those roads that already have suitable alinement by widening and placing 8 to 12 ins. of natural gravel or shale. The tractors and bulldozers are used to improve alinement."

In Pierce Co., Wash., W. A. Stancer, Road Engineer, reports that motor graders and power loaders are used very effectively in pulling ditches, sloping cuts and widening fills, using for the latter work material gained by sloping cuts.

Natrona Co., Wyo., of which Albert M. Zuill is County Surveyor and Ass't. Supervisor of Roads, replaced four bridges with corrugated iron culverts and earth fills. These bridges were of untreated timber, with high maintenance costs, and unable to carry present-day loadings. Equipment used included a heavy crawler tractor and a large scraper.

Tractors and Scoops

C. C. Nelson, Engineer of Douglas Co., Minn., reports building 25 miles of high-type road last season with three tractors and scrapers, one motor patrol and a crew of six men. A special truck has been developed by C. W. Turnell, County Highway Engineer, Wright Co., Minn., who uses a tailgate sander, operated by a power takeoff, on a $1\frac{1}{2}$-ton truck, for seal coating isolated short stretches of bituminous surfaces to check raveling.

In his program of road surfacing —about 100 miles of roads were surfaced—L. J. Osborn, Engineer of Gage Co., Nebr., found a stone crusher the most useful equipment. B. F. Wiedel, Chairman of the Thayer Co. Road Commission, Nebr., says: "Track type front-end loaders have been the best all-around machines in our county. A good operator can replace culverts, digging out the old ones and placing new ones; he can cut out bridge approaches; open ditches; dig channels; build grades; load dirt, gravel or snow; and level grades." In Cass Co., C. E. Markham, Engineer, reports: "Our roadside clearing was one project on which our equipment was used most effectively—two crawler tractors with bulldozers."

On a 10.5-mile grading and graveling project, Burleigh Co., N. D., Wm. F. Gillen, County Engineer, moved 230,000 cu. yds. of dirt in $4\frac{1}{2}$ months with two 11-yd. scrapers, one patrol and one crawler tractor and bulldozer. Cass Co., N. D., R. S. Kanoske, County Engineer, reports building a bridge by contract over the Red River. This bridge is 412 ft. long, has concrete abutments and pier and a grid steel floor. Another similar bridge is now under construction.

Lincoln Co., So. Dak., W. F. Calvert, Highway Sup't., placed 16,000 cu. yds. of gravel surfacing in one month's time using a portable late model crusher and 12 motor trucks. A power shovel was used to load dump trucks in the program of surfacing Lawrence Co., S. D., roads with slacked porphyry. Ray Smith is Highway Sup't. C. C. Stephens, Highway Superintendent of Pennington Co., S. D., used a half-yard dragline equipped with hook and slings to remove a used bridge on an abandoned railroad. Minnehaha Co., S. D., F. H. Schrader, Highway Superintendent, has found that a half-yard gas shovel can be used for gravel loading, ditch cleaning and repair, pile driving and bridge excavation.

E. M. Rogers, Highway Commissioner of Barron Co., Wisc., writes: "We give particular attention to grade alinement and drainage, and attempt to get flat curves and easier grades. The minimum width of the finished grade is 24 ft., with a flat bottom ditch 4 to 6 ft. wide, and $2\frac{1}{2}$ to 1 slope on the shoulder or back slope. In heavy clay sections, the road bed is graded from 26 to 28 ft. to allow for a 6 to 9- inch sand lift. On top of this sand is placed a 3-inch bond course of clay gravel or shale to make a mixing table on which to place the bituminous sur-

face mat. This mat consists of 1,000 cu. yds. of crushed gravel per mile, mixed with a heavy grade SC road oil. This gives a compacted surface 2½ ins. thick, spread 22 ft. wide. All of our heavy oiling jobs are mixed on the road with a travel plant. The bituminous surface is usually placed the year after grading is completed."

A heavy motor grader and a central mix bituminous plant, along with a bituminous paver, are the essential factors in bituminous surfacing in Jefferson County, Wisc., G. W. Neis, Shop Sup't. In Manitowoc Co., Wisc., Edward Berkedal, Highway Commissioner, three crushing plants are relied on to furnish the 150,000 cu. yds. of aggregate used annually in resurfacing.

In Clinton Co., Ill., James G. Cooney, County Sup't. of Highways, a D-4 Mobiloader has been used for ditch cleaning; a heavy crawler tractor with 6-yd scraper for grading; an excavator for loading from a gravel pit; a 3,000-watt portable generator with electric tools for bridge work; and motor patrols on grading and maintenance. For building a road oil mat, W. F. Jeschawitz, Jr., Sup't. of Highways, DeWitt Co., Ill., uses a distributor, a soil mixer, a motor grader, a 7-ton tandem roller, and a rubber tire roller. Vermilion Co., Ill., W. C. Dye, County Highway Sup't., used a one-pass bituminous mixer and a half-yard shovel on 2.3 miles of soil-cement 21-ft. base course. Macon Co., Ill., A. N. Buck, Sup't. of Highways, for placing a seal coat, using emulsified asphalt, used a 1,000-gal. distributor, two aggregate spreaders simultaneously, and a tank car heater.

One of the most effective pieces of equipment used by Stephenson Co., Ill., was a crushing plant which, in the course of the year, produced 110,000 cu. yds. of crushed stone and gravel. O. G. Hively, is County Sup't. of Highways. M. J. Benscoter, County Sup't. of Highways, Morgan Co., Ill., used two front-end loaders and motor patrols for ditching and backsloping 10 miles of existing traffic bound gravel roads.

Mapping a Road's Weak Spots

"One of our most effective pieces of equipment this year was a foot-o-meter. We used this in obtaining accurate information on the placing of maintenance stone in patching weak bases. The meter was used in developing a strip map of each section of highway, determining the location and making a permanent record of those sections of the road which developed frost boils or spongy sub-grades from year to year. We intend to have a record of these spots so that they may be considered should the need arise to change the type of surface. In this case, more detailed attention may be given to base preparation and prior correction of poor subgrade conditions." R. G. Blackledge, Co. Highway Sup't., McDonough Co., Ill.

A portable gravel plant was used effectively for graveling roads in Steuben Co., Ind.; also a bituminous distributor on a patching program. Paul Duiguid is Sup't. of Highways. In DeKalb Co., Ind., Wayne Van Auken, Surveyor, cut down high berms on old gravel and stone roads, recovered thousands of yards of usable material and recontoured the road profile. In Blackford Co., Ind., W. R. Voght, County Engineer, an all-wheel drive motor grader was highly effective in side ditching work. John S. Robinson, Road Sup't. of Newton Co., Ind., used his four motor graders to remove side berms and clean roadside ditches. Clarence Seymour, Road Sup't. of Hamilton Co., Ind., did the same kind of work but found a power loader efficient in loading the dirt into trucks for final disposal.

In Michigan, Wexford Co., A. L. Burridge, Engineer, used patrol graders effectively on mixed-in-place construction; Cass Co., L. J. Hendryx, Engineer-Manager, used a gravel plant for producing resurfacing aggregate; and Jackson County used a portable asphalt mixing plant and spreader for oil-aggregate surfacing.

With a hot-mix asphalt plant, Ingham Co., Mich., F. K. Evans, Engineer-Manager, laid 65 miles of bituminous surfacing, 20 ft. wide and 2 ins. thick. T. S. Dundon, Engineer, Luce Co., Mich., built 2-ft. flat bottom ditches entirely with a grader. Mason Co., Mich., R. E. Lunde, Engineer, did an unusual job of soil stabilization with a soil mixer. Montcalm Co., Mich., Ray G. Hafey, Sup't., blacktopped 10 miles of road with a road mixer.

A surface treatment program was carried out by Henry Co., Ohio, Lynn J. Walker, County Engineer, in which the most effective equipment was a new distributor owned and operated by the county. Putnam Co., Ohio, Stanley Bell, County Engineer, used very effectively a heavy motor grader and a 1,250-gal. bituminous distributor. A. J. Moon, County Engineer, Wyandot Co., Ohio, says: "We have many small bridges, less than 30-ft. span, built 50 or 60 years ago without proper estimation of waterway requirements. We are replacing these with reinforced concrete culvert pipe. We check the waterway requirements and provide capacity for adequate runoff. Our ⅜-yd. crane will handle 72-inch pipe; and we use this with a ½-yd. dragline bucket to handle excavation and channel changes at these culvert sites.

H. L. Dittmer, County Engineer, Trumbull Co., O., cut down a 16% grade (to 10%), and widened and terraced the back slopes for 120 ft. on either side of the road, using a power shovel, trucks, bulldozer and grader.

Courtesy Galion

● ***MOTOR grader with snow wing works a Washington State highway. This is one of the many uses for motor graders reported herewith.***

SEWER construction

HENRY CHARLES SUTER

EXTENSIVE additions to the Dayton Beach, Fla., sewer system provide sewerage service to practically every home in the 100 sq. mile area of both the mainland and the peninsula, whereas the original system served only the main streets of the city. The new construction required a total of 185,423 ft. of vitrified sewer on the peninsula across the Halifax river from the mainland; and 120,474 ft. on the mainland. A new sewage treatment plant, using chemical coagulation and vacuum filtration of the undigested sludge, was constructed and has been in operation for the past year. This plant was described in the April, 1949, PUBLIC WORKS.

This new construction has permitted a marked improvement in public health conditions. On the mainland, 1,900 buildings have been connected to the sewers; and on the peninsula 1,280 buildings. Thus, some 15,000 people in 3,180 homes, who previously had to rely on outdoor toilets, septic tanks or cesspools, now have the benefits of a sewer system and a treatment plant.

To connect the mainland system to the peninsula system, and to bring the sewage to the treatment plant, a 20-inch cast iron force main was constructed across the Halifax River. Under the channel, the pipe is laid 18 ft. below mean low water; elsewhere it is laid in a trench in the river bottom with 24 ins. of cover. This was laid from a barge by means of a cradle, utilizing the services of a diver. Joints are of the bolted type, except for the channel section, which is flexible joint. The channel section is approximately 100 ft. wide.

The Sewer System

In addition to the vitrified sewer, 30,480 ft. of Transite and 10,823 ft. of cast iron sewer were required for force mains. Because of the topography—the city is very flat—nearly all the sewage has to be pumped. In the old system, there were 10 pumping stations. The additional sewers constructed required 15 new pumping stations, with reconstruction of many of the old ones. Pump motors now total 484 hp. of which a little more than one-half is on the mainland.

Of the vitrified clay pipe on the peninsula, there are 56,186 ft. of 6-inch house connections: 104,715 ft. of 8-inch; 10,629 ft. of 10-inch; 1,553 ft. of 12-inch; and 8,626 ft. of 18-inch. On the mainland, 35,838 ft. represented 6-inch house connections; there were 78,122 ft. of 8-inch vitrified pipe; and 6,644 ft. of 10-in., 12-in. and 15-inch. Transite pipe was used freely. 20,831 ft. being laid. This was mostly 8-inch, but included some 10-inch and 16-inch.

Force mains were laid under six separate contracts. Those of Transite totaled 30,840 ft., including 515 ft. of 20-inch; 2,122 ft. of 18-inch; 8,252 ft. of 16-inch; and other sizes to 6-inch. The 10,083 ft. of cast iron included 2,988 ft. of 24-inch, and 2,255 ft. of 20-inch.

Loose sand and muck was encountered on much of the work, and the high water table added to the

● ***PROCEDURE** in laying vitrified clay pipe for sewers. The trenching machine is shown in the background. Sheeting was not necessary.*

in DIFFICULT *ground*

difficulties of construction. Most of the trenches required sheeting. For the trenches, 2-inch sheeting was driven vertically behind 5-inch H-beam walers with 4-inch by 6-inch timber struts. Single wall coffer dams were used on some of the pumping stations, but each was a separate problem. On the largest of the stations, a 24-sided polygon was used, employing 4-inch horizontal sheeting placed between the flanges of 8-inch steel shapes driven on centers 5 ft. 9 inches apart, on a 44-ft. diameter. Four well point systems were available and were constantly used on the sewer line work, on the pumping stations and at the treatment plant. Well point pumps included four Marlow single-acting and one Marlow double-acting diaphragm pumps; two 4-inch Marlow centrifugal pumps were used for dewatering. The illustrations herewith show various phases of the work.

Construction Problems

Trenching was done by machine, using a Parsons 21 trencher and two Unit 514 excavators. All backfill was placed with bulldozers or cranes, keeping to a minimum the amount of hand work necessary.

A special type of sewer joint was used, which included a bitumastic compound. This was designed not only to prevent infiltration but to resist root growth. Turk's cap, which grows freely around Daytona Beach, is noted for its tendency to seek and enter sewer joints. All sewer lines were tested for infiltration before acceptance.

Equipment on the job included: 5 crawler cranes with clamshell buckets—two $\frac{5}{8}$ yd. Northwest, one $\frac{3}{4}$ yd. Koehring, one 1-yd. Marion and one $\frac{3}{4}$ yd. Lima; also two Michigan truck cranes; three air compressors—one Sullivan 105 cfm, one Gardner-Denver 210, and one Ingersoll-Rand 315; two International TD6 tractors; one Galion roller; the trencher and excavators previously noted; and about 20 motor trucks.

Russell and Axon are consulting engineers, with Joe Williamson, Jr., Vice President, of the Daytona Beach office in charge. J. M. Titus is superintendent of Public Works for Daytona Beach and William J. Leseman, Jr., is City Engineer.

● ***CRADLE** was used for laying cast iron pipe across channel.*

● ***WELL-POINTS** were necessary on some portions of the work. This section was excavated with clam-shell and crawler-mounted crane.*

HOW TO USE CHLORDAN

THE development of resistance to DDT by house flies in many areas makes it necessary that substitutes for DDT in fly control be considered. Of all the materials which have been tested at the Savannah laboratory against DDT-resistant strains of flies, chlordan has given the best results. Although it has some undesirable features, chlordan is being recommended for field use in fly control, with certain restrictions.

Chlordan is known to have fumigant properties, and the toxicity of chlordan fumes to higher animals has not yet been fully evaluated. Therefore, chlordan is not being approved at this time for indoor residual application to the entire walls and ceilings of occupied homes. It appears safe to permit its use in selected portions of kitchens, such as around baseboards, windows, and doors, and as a general residual spray for porches and in outbuildings, including the walls and ceilings of such outbuildings. For such usage, a 2½ per cent finished emulsion is suggested. When applied at the rate normally used in residual spraying, a deposit of approximately 100 mg. of chlordan per square foot will be obtained.

Chlordan should not be applied to dairy animals or as a residual spray for fly control in dairy barns, and it should never be applied in any manner which will result in the contamination of food materials of man or animals.

Limited field tests with chlordan emulsions as space sprays indicate that chlordan is as effective as DDT for this purpose when applied at approximately ½ the dosage of DDT. Oil solutions of chlordan have not yet been tested as space sprays. Due to the increased toxicity hazard of oil solutions, it is recommended that chlordan emulsions be used in applying outdoor mist sprays for fly control. Pending further investigations, a 2½ per cent finished emulsion is suggested for this purpose.

Chlordan has also given effective results when used as a fly larvicide. A dosage of 100 mg. of chlordan per square foot applied to the surface of fly breeding media should give good control of larvae present at the time of treatment. For manure and other compact material, a 2½ per cent emulsion is suggested. For relatively loose breeding material, such as loose stable litter, the use of more dilute emulsions and larger volumes of finished spray is desirable.

Refined grade technical chlordan should be used in preparing concentrates. A suggested formula is technical chlordan 8 gallons, Triton X-155 (or X-100) 2 gallons, and xylene 40 gallons. This will prepare a concentrate containing approximately 25 per cent technical chlordan. A mixture of one part of this concentrate with 9 parts of water will give the desired 2.5 per cent emulsion. There are on the market satisfactory commercial concentrates, but their composition and packaging are so variable that no specifications are available for their purchase.

Chlordan concentrates should be stored in glass, aluminum, aluminum-clad steel, or high-bake phenolic lacquer-lined metal containers. If stored in other types of containers, chlordan concentrates may lose emulsifiability, cause drum leakage, or undergo marked discoloration and possible chemical decomposition. Sprayers in which chlordan emulsions are used should be washed thoroughly at the end of each day's work to remove chlordan residues, which may attack and damage the metal portions of the sprayers.

Skin applications of chlordan are known to be considerably more toxic than DDT. Operators using chlordan must take every feasible precaution to avoid skin contamination with chlordan in any form. Waterproof, xylene-resistant gloves and other protective clothing should be worn by operators of mixing stations. Skin areas contaminated with chlordan sprays or concentrates should be washed immediately with soap and water, and contaminated clothing should not be worn.

Chlordan formulations are now being used widely for spot treatments for the control of roaches, waterbugs, ants and other household pests. Such restricted use is not considered objectionable or dangerous providing the above precautions are observed.

This information was prepared by the Technical Development Services, Communicable Disease Center, U. S. Public Health Service.

Milwaukee Tries Street Parking Fees

John E. Hubel

With the increase in the number of new cars, and the lack of private parking garages, the Milwaukee police department has had under consideration for some time the all-night parking of the cars on streets in certain sections of the city at a monthly fee. Now this has been brought to a head, and, beginning the first week in May, permits are being issued at all of the police stations in the city. These are good for one month of night parking in restricted areas at $4 per month, or $2 for one-half month, payable in advance.

In the first two days, 1,400 such permits were issued, with the prospect of many more deciding to pay for night parking at the curb at about the same price as usually charged for space in a back alley garage, although some pay $5 and more for the indoor parking.

Motorists must show the permit on the windshield of their cars, but only while the car is so parked, and never when the car is in operation during the other hours of the day or night. Cars must be locked. The permit can be denied when indoor parking facilities are found to be available, as motorists must state on the application that they cannot find any indoor parking.

This system of permits for night parking on city streets in designated areas is said to take a big load off the police department in another way—the constant calling by motorists at all times of each day for permission to park the car at a curb for that night.

The method is to be carried on as long as the lack of indoor parking space exists. The parking lots usually are not responsible for cars parked after midnight, when the attendants leave.

CURING WATER SUPPLY DIFFICULTIES AT A WARTIME ARMY POST

N. W. NESTER

WATER is just as necessary in war as it is in peace time, and many of the problems confronting the Army in the period immediately preceding World War II concerned an adequate and safe water supply for cantonment areas. Moreover, sites were often selected to provide conditions physically similar to those in overseas war areas. Consequently some posts were located in the dry areas of the southwest where known water supplies were very scarce. Many camps had to be built so rapidly that, lacking standard materials, substitution of inferior materials was necessary.

In addition to the problems resulting from short supply, the rate of increase of troops necessitated expansion of bases for which original plans did not contemplate expansion, resulting in patched and overtaxed utilities. In the early days of the war, there was often inadequate study given to the design of water systems; in some cases, entire installations were made from "standard" plans.

A rather typical example of the foregoing procedure existed in an air base in an arid area in the southwest. The base, built in 1940, as an auxiliary or emergency landing strip, originally consisted of one runway and several buildings. The water supply was drawn from two wells delivering about 200 gpm. Water was derived from an underground basin about two miles distant and on private property. A municipality about 7 miles away drew water from the same round water source. Records in the office of the municipal water works showed that the subsidence in the ground water level over a period of 12 years was 8 feet.

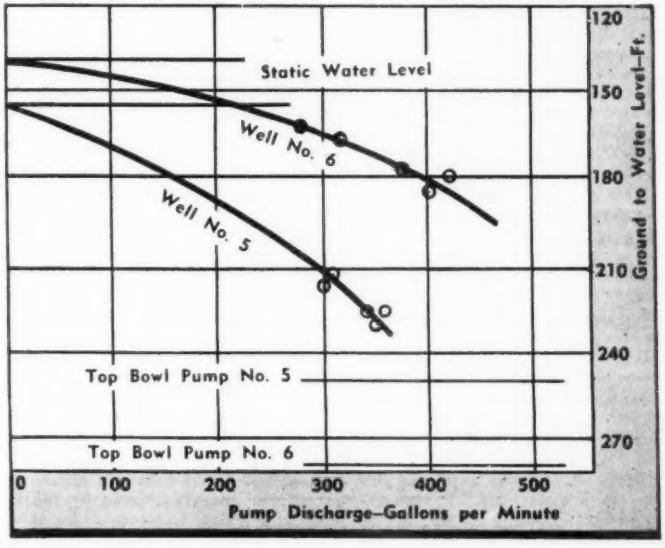
Expansion Increases Troubles

The air base was expanded in 1942 and converted into a pilot training base. Additional wells were drilled and the distribution system extended. Post water consumption records were of little value, since they were obtained by multiplying the number of hours the pumps operated by the rated capacity of the pumps. Since the pumps were operated in series, it would appear that the actual consumption was considerably less than the recorded consumption. However, other post records indicated that the maximum consumption had been 995,000 gpd, the average consumption 550,000 gpd., and the per capita consumption 157 gals. per day, with a maximum consumption of 230 gallons per person in June and September. Based on the number of personnel stationed at the post, and using Army consumption factors, the total probable daily demand due to personnel was estimated to be about 473,000 gpd. In addition, however, there were two swimming pools, each filled twice weekly for 5 months; 260 evaporative air conditioners estimated to use about 30 gals. per each day for 4 months of the year; and washing requirements for training planes totalling 2,800 gpd. These needs added about 50,000 gpd. to the previous total. When the post was again expanded so that, in 1944, when there were 4,600 military and 1,000 civilian personnel at the station, the water problem became acute.

A leak survey indicated negligible losses in the distribution system, but faucets and taps through the post were leaking and 150 automatically flushed urinals were running continuously. The enlisted men's swimming pool, built of wood staves, lost a foot of water in depth po ol,
or 33,000 gpd. The officers' swimming pool, of badly checked and cracked unreinforced concrete, lost two feet of depth per day or 50,000 gals. An estimated 20,000 gpd were used in irrigating a seeded area which began as a dust control project and developed into a golf course.

The Process of Rehabilitation

In the process of rehabilitation, operators were trained; wells were metered; an alarm system was installed from the pump house to the reservoir; swimming pools were repaired and chlorinators installed; water in swimming pools was recirculated; daily logs were maintained at each well; water in evaporative coolers was recirculated; manually



● ***TYPICAL well yield curves show the lowering of the ground water level by 70 ft. when pumping at a rate of 350 GPM.***

operated valves were placed on the urinals; irrigation was controlled and practiced at night; well houses were enlarged and provided with additional ventilation; and cooling water for the engines operating the pumps was piped directly from the pump discharge and recirculated back into the wells.

The wells and pumps were carefully studied. Tests were run to determine well capacities and drawdowns, and the suitability of the equipment in use. Depth gages were checked with drop cords. Four wells were in use, Nos. 3, 4, 5 and 6.

Well No. 3 was 399 ft. deep, with a depth to ground water of 166 ft. It was equipped with a Layne deep well turbine of 250 gpm capacity, driven by a 40 hp electric motor. It was found that the safe yield was 196 gpm at 57 lbs. pressure into the discharge line. At lower pressures, the output increased but the well was depleted in 20 minutes. One stage was removed from the pump and other minor changes made with the result that satisfactory operation were obtained.

Well No. 4 was 310 ft. deep, with ground water 141 ft. below the surface. This well had a 400 gpm Layne pump driven by a Buda 61 hp engine, which was replaced with a more powerful engine—and AC 110 hp, with the Buda as a standby. This well was found to be able to provide a safe yield of 200 gpm.

Well No. 5 was 335 ft. deep, with a depth to water of 154 ft. It was equipped with a Layne pump and a Buda 72 hp engine. Because of the gear ratio, the engine had to be operated at excessive speed, causing inefficient operation and excessive wear. The gear ratio was increased to $3\frac{1}{2}$:2 and the engine set to operate at 960 rpm. The safe yield of this well was found to be 300 gpm.

Well No. 6 was 403 ft. deep and had a Peerless pump operated by a Buda 72 hp engine. Since this well had a safe yield of 400 gpm, the engine was too small and was replaced with a 148 hp belt drive Waukesha, using the Buda as a standby.

The established schedule of well operations was as follows: Wells 5 and 6, from 8 am to 4 pm, providing 700 gpm during that time; wells 4 and 6 from 4 pm to midnight, providing 600 gpm; wells 5 and 4 from midnight to 8 am, providing 500 gpm. In addition, well 3 was operated from 4 pm to 8 am at 196 gpm. This schedule provided 1,052,000 gpd for 4,600 military and 1,000 civilian personnel. It proved to be fully ample for domestic purposes, evaporators and plane washing, while providing some water for irrigation.

The difficulties encountered at this post were representative of those at many others. This article is not intended to criticize the War Department (as it was then called) or any of its members. Neither can justifiable criticism be directed at products or their manufacturers. It is unfortunate that war conditions developed so rapidly that the disposition of adequate stocks of equipment was neglected and professional skills were malassigned. A valuable lesson has been derived from conditions which developed at this and other posts, and a study of such conditions should benefit all. Certainly, it is clear that better use must be made of professional skills, for many of the defects described resulted directly from the apparent necessity of using men on work for which they were not qualified by either experience or training. No doubt most of them did their best, but that was not enough.

Equipment for County Soil-Cement Road Construction

A 6-inch compact thickness soil-cement base with a single course bituminous surface treatment was built by Madison Co., Tenn., of which E. C. Rodgers is County Engineer. Equipment used included the following:

Grading equipment: Two D-6 tractors and bulldozers; one D-7 tractor with 12-yd. pan; one 8-yd. pan; one sheepsfoot roller; and two heavy motor patrols.

Base equipment: A P & H single-pass stabilizer; a Smith cement spreader; nine 2-ton trucks; one 30-ft. belt conveyor; a sheepsfoot roller; two motor patrols; one rubber tired roller; one spiked tooth harrow; and one rubber tired tractor.

Surfacing equipment: One 1,000-gal. distributor; six 2-ton motor trucks with tail gate spreaders; a rubber tired tractor; a rubber tired roller; and a 2-car steam heater.

Low Rate Filter for Custer

A modern sewage treatment for Custer, S. D., was put into operation early last winter. The plant, designed by Julian Staven, Consulting Engineer and constructed by Black Hills Ditching Company, was described in the Clarifier, publication of the South Dakota Department of Health Sanitary Engineering Division. Winter population is about 3,500; summer population rises to 8,000.

A Parshall flume is followed by an Infilco griductor. Pumping is necessary; there are two Aurora 300-gpm pumps, discharging against a head of 37 ft. The primary clarifier, which has a Dorr mechanism, is 25 ft. in diameter and 10 ft. deep.

The filter, which is equipped for recirculation, is 65 ft. in diameter with a media depth of 8 ft. A Dorr 4-arm distributor is used. The filter is not covered, and ice troubles have already been experienced.

The secondary clarifier, also Dorr equipped, is 25 ft. in diameter and 7 feet deep. Secondary sludge is returned to the wet well and thence to the primary clarifier.

The heated digester is aboveground, and is 25 ft. in diameter and 17 ft. in effective depth. There are uncovered sludge beds, each 70 ft. by 29 ft. Ray Stender is plant operator.

Municipal Costs

(*Continued from page* 33)

very favorably with other municipalities, considering the fact that the service given is reasonably good in all cases. The demand for increasing the quantity of these services continues on the up-grade and we are continually placed on the defensive in order to keep the costs within reason.

Public Works Inventory

An inventory of Public Works may be of interest to those who wish to compare costs with those of other municipalities.

1. *Sewage Treatment Plant.* Average capacity 3 mgd.; it consists of pumping, settling tanks, separate sludge digestion, heat exchanger, trickling filters, final settling, chlorination, and glass covered sludge beds. Average flow is 2.1 mgd.
2. *Incinerator* capacity 75 tons per 24 hours.
3. *Sewers* total 59 miles—8″ to 36″.
4. *Garbage Collection* by contract.
5. *Streets*, 24 miles, all improved, oil surfaced macadam, penetration asphalt, bituminous concrete, and concrete.
6. *Catch Basins*, 230.
7. *Playgrounds*, 5.
8. *Car Spaces*—494 in parking yards off street.
9. *Street Lights*, 448, 1,000 to 4,000 Lumens.
10. *Public Buildings*, 6.
11. *Trees*, 3,000.

Public Works ENGINEERING DATA

Bridges from Precast Concrete Units

A new development in small bridge construction involves the use of precast concrete cribbing, deck slabs and bridge seats. The precast cribbing may be either open face or closed face. The deck slabs weigh about 300 pounds per lineal foot, or 3 tons for a 20-ft. section. These slabs are made with limestone, river sand and air entrained cement, reinforced properly and cured for 7 days. Each slab has lifting holes at the center of gravity for easy handling.

A bridge roadway 24 ft. wide can be placed in four hours with a 3-man crew. L. A. Porter, Bridge Engineer for Pennsylvania, pioneered this method in this country. In rebuilding 14 bridges by this method last year, an average saving of $595 was attained over the pour-in-place method.

The slabs are designed for H-20-5-16 loading or the H-15-S-12 loading, as desired.

Trenching Through the Ice

To lay a cable across the Cedar River at Cedar Rapids, Ia., where the river was 700 ft. wide and 8 to 10 ft. deep, during cold weather, the following procedure was used: A portable chain-saw was utilized to make two parallel cuts in the ice. A Schield Bantam trench hoe, which weighed only 8 tons, was moved onto the ice. It first knocked out the slab between the two saw cuts. Then it cut the trench in the river bottom, dumping the spoil on the ice alongside. The 700 ft. of trenching was completed in a day and a half.

Garbage Collection and Street Cleaning in Waukesha

The cost of cleaning paved streets in Waukesha, Wisc., in 1949 amounted to 50¢ per capita. Mechanical sweeping was used for 3,230 curb miles at a cost of 98 cents per curb mile. In 1948, the cost of mechanical sweeping per curb mile amounted to $1.18.

Garbage collection costs amounted to 96¢ per capita in 1949. The cost per collection was 5.8¢, the same as in the preceding year. Collections from hotels, restaurants and butcher shops are made daily. From groceries and boarding houses, three collections a week are made; and from residences, two a week during the four summer months and one a week the rest of the year.

The average amount of garbage per collection was 12.7 lbs. and the estimated production in lbs. per person per year was 216, compared to 220 pounds in the preceding year. Cost per cubic yard collected was $2.077. Three Heil Colecto bodies mounted on Chevrolet trucks are used for collection. These bodies hold 13 cu. yds. each.

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Cost of Laying Water Pipe; 2-Way Radio Installed

The cost of laying water mains in Elmira, N. Y., during 1949, is reported as follows: 6-inch, 7,226 ft., $3.65 per ft.; 8-inch, 2,200 ft., $3.88 per ft.; 10-inch, 296 ft., $6.61 per ft.; 12-inch, 4,688 ft., $7.75 per ft.

The Water Board installed, last June, a 2-way radio control covering emergency trucks and other equipment. The Central Station was placed at the Filtration Plant, and the mobile units in the trucks of the Maintenance and Meter Departments. "The use of this type of communication has greatly speeded up our ability to serve our customers and to take care of emergencies quickly and efficiently."

Waterproofing Soil with Resinous Materials

This is a paper by K. E. Clare describing work at the Road Research Laboratory, Harmondsworth, England. It was found that only about one per cent of resin is needed to give a maximum effect, but this may take some time to develop. The effect is reduced if the soil is alkaline, and the presence of the resin may affect the compaction properties of the soil. The mechanism of waterproofing was investigated under the following main headings:—theoretical considerations; determination of the reduction in the rate of water absorption; contact angle and surface tension experiments; adsorption at the solid/liquid interface; surface activity of the resinous materials studied; surface film theory of waterproofing. It is concluded that waterproofing is due to the formation of a resin film at the air/water interfaces in the soil. It was found that it is desirable to have some water in the soil when the resin is added and that drying the resin-soil mixture at temperatures which may be expected in very hot climates does not destroy the waterproofing effect.

Cleaning an 80-ft. Digester

In connection with improvements to the San Francisco sewage treatment plant, it was necessary to clean out an 80-ft. digester. During a period of 25 days, some of the tank contents were transferred to other tanks by gravity and by pumping. Plant effluent was added to the digester to maintain a continuous flow. This procedure resulted in a lowered total solids supply with scum on the top and sand and sludge in the bottom. Every precaution was taken to protect the workmen working inside the tank and prevent the formation of explosive mixtures. Fresh air was supplied by a blower discharging into the tank. The air in the tank was tested for explosibility and hydrogen sulphide at frequent intervals. Workmen were equipped with safety belts, helmets and proper clothing. One man was charged with safety procedures. As much of the scum as possible was removed by flushing with high pressure hoses to the scum overflow. Then the tank was drained, leaving about 44 ins. of sand and sludge in the bottom. This was flushed with hoses to the main outlet. A sand and sludge pump discharged the mixture to a sewer. It was necessary to install a screen around the outlet to protect the pump. The final cleaning operation took about three weeks. It was found that considerable corrosion had occurred in the supporting members and plates of the original fixed steel dome. This was replaced and the new dome was painted with three coats of bitumastic on the inside, and one coat of bitumastic primer, two coats of heavy bitumastic and one coat of aluminum on the outside.

When you need special information—consult READERS' SERVICE DEPT. on pages 79-83.

PUBLIC WORKS DIGESTS

WATER WORKS . . 55 • HIGHWAYS AND AIRPORTS . . 61 • SEWERAGE AND REFUSE . . 65

This section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.

THE WATER WORKS DIGEST

Diatomite Filters For a Municipal Supply

Cherry Valley, N. Y., population 700, is one of the first municipalities to adopt diatomaceous filtration of its water supply. A 0.25 mgd plant has been in operation for about 7 mos. and consistently produces water with low turbidity and bacterial count and no Coliform bacteria. There are two filter units 3 ft. in diameter and 8 ft. high, each containing 94 sq. ft. of filtering area on 45 aluminum-oxide tube elements. The filter rates vary from 0.7 to 1.4 gpm per sq. ft. These, with slurry feeder and agitation tanks, were furnished by Proportioneers, and a semi-automatic chlorinator by Builders-Providence. With newly washed filters, influent pressure is nearly 35 psi and effluent pressure about 1 lb. less. The effluent pressure decreases to about 5 lb. in from two to five days of filtering, when the filter is backwashed, using 1100 gal. of water for each filter. The plant is operated for $4.51 to $6.87 a day, or 3¢ per 1,000 gal. of water filtered.

Edwin S. Pegg—"Diatomite Filters Turn Out Safe, Clean Water;" *Engineering News-Record*, May 18.

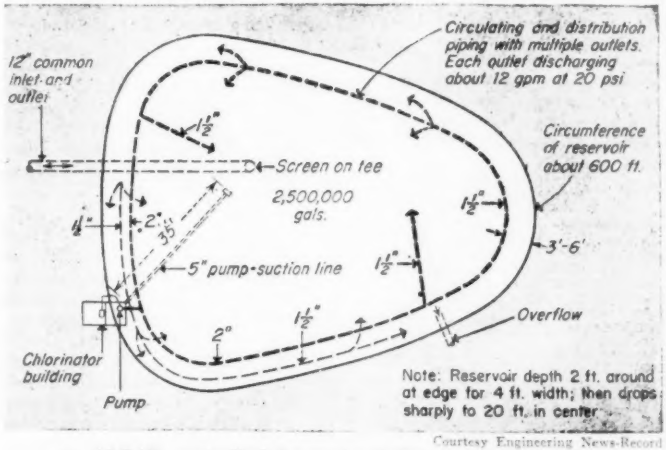
Keeping a Reservoir Free of Algae

Chatham, N. Y. obtains its water supply from drilled wells. The water is pumped into the distribution system, on which floats a 2.5 mg open reservoir. For several years algae developed in the reservoir during the summer months in quantities ranging from 900 to 8700 units per cc. Use of copper sulphate and chlorine and thorough cleaning of the reservoir was not effective. The problem has been solved by installing a chlorinating and recirculating system at a cost of less than $5,000, with a cost per day of 85¢ for chlorine and 50¢ for power for pumping. Water is drawn from the deepest part of the reservoir through a 5" pump suction and, as it leaves the pump, is dosed with sufficient chlorine to maintain a maximum free residual of about 0.35 ppm in all parts of the reservoir. The chlorinated discharge is conveyed to various parts of the reservoir by 1½" and 2" copper pipe provided with a number of outlets, so distributed and pointed as to keep the water circulating both horizontally and vertically, permitting no dead spots. When first started, the system required a chlorine dose of 30 ppm to maintain a residual of 1 ppm in the reservoir, but this fell off to 5 ppm to give a 0.35 ppm residual. This is reported to limit algae to less than 10 units per cc.

"Controlled Continuous Chlorination Keeps an Open Reservoir Free of Algae;" *Engineering News-Record*, May 18.

Small Filter Plants

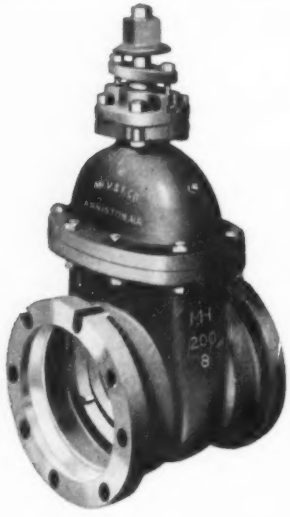
At present there are in Georgia 31 filter plants with capacities of less than 500,000 gpd. Of these, 9 have raw-water storage, 22 draw direct from the stream. Dry chemical feeders are used by 27, solution feeders by 4. Mixing is by gravity baffles in 24, mechanically in 7. Anthracite is the filter medium in 2, sand in 29. Wash water is pumped in 25, obtained from a tank in 2,



Courtesy Engineering News-Record

• **ALGAE controlled by recirculation and chlorination.**

Easy to Install Mechanical Joint



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and from the city system in 6. For disinfection, 27 use liquid chlorine, 4 use hypochlorite.

Dry feeders are preferable to solution for lime, alum, soda ash and activated carbon if they are accurate enough for the small quantities required. Hypochlorites may be more satisfactory than liquid chlorine when rates are less than 100 gpm. Settling basins should give at least 6 hr. theoretical retention, have a length to width ratio of 2½ or 3 to 1, or more; and have multiple skimming weirs at the discharge end rather than submerged weirs. Ample clear-water storage capacity should be provided. Current purchased from the local power company is used by practically all plants; and there should always be standby pumping equipment, generally gasoline engine with belt drive or gasoline-driven generator. A laboratory for testing chlorine residuals, alkalinity, pH and coagulant dosage is imperative.

N. M. deJarnette—"Small Plant Experiences Filtering Surface Water in Georgia;" *PUBLIC WORKS*, June.

Chlorinating Swimming Pools

From tests made on four Connecticut swimming pools as a cooperative project undertaken with W. L. Mallmann, Michigan State College, with financial assistance provided by Wallace & Tiernan, the following conclusions were reached:

1. Free available residual chlorine is a more effective bactericide than combined available residual chlorine for the treatment of swimming pool water.

2. The values of 0.4 to 0.6 ppm of residual chlorine as recommended by the Joint Committee Report, if interpreted to mean free available residual chlorine, will produce bacteriological results that will comply with the Joint Committee Report's recommended standards for total number of bacteria and coliform bacteria in swimming pools when in use.

3. The minimum value of 0.7 ppm which has been suggested in the past for swimming pools using chloramine (combined available residual chlorine) treatment is insufficient to produce bacteriological results under conditions of this study which will meet the recommended standards of the Joint Committee Reports.

4. Streptococcal bacteria in swimming pools are more resistant to chlorine than coliform bacteria.

Eric W. Mood—"Effect of Free and Combined Available Residual Chlorine Upon Bacteria in Swimming Pools;" *American Journal of Public Health*, April.

Chlorine Demand at Detroit

The Detroit Dept. of Water Supply adopted the practice of free residual chlorination in February, 1946. The chlorine demand characteristics have been under investigation since then, both theoretical and practical considerations being studied.

Several conclusions can be derived from these studies:

1. Temperature and turbidity are minor factors in the chlorine demand of Detroit's water supply.

2. When a water is chlorinated to give free chlorine residuals, there is a definite mathematical relationship between the demand at one contact period and that at any other contact period.

3. The mathematical relationship between chlorine demands at different contact periods for Detroit's water supply makes it possible to maintain specific chlorine residuals in the finished water on the basis of preliminary determinations.

4. A study of the chlorine demand constants experimentally derived from various water supplies and from specific compounds offers a qualitative indication of the nature of the chlorine demand substances present in a natural water.

Douglas Febon and Michael J. Taras — "Chlorine Demand Constants of Detroit's Water Supply;" *Journal, Am. Water Works Ass'n*, May.

Laboratory studies at Detroit reveal the importance of the molecular architecture of the individual chemical compound in determining the magnitude of the chlorine demand. Inorganic ions, such as ammonium, nitrite and sulfide, combine rapidly with chlorine, while organic compounds generally require longer reaction periods.

The fifteen-minute chlorine demand of most amino acids and such organic materials as peptones and gelatin is related to the amount of albuminoid nitrogen. The albuminoid nitrogen determination measures the amino nitrogen freely available for immediate chlorination. The term "free available nitrogen" is admissible in connection with the fifteen-minute free-chlorine demand.

These investigations emphasize

the complexity of the chlorination problem and the need for additional analytical procedures and tools to study highly polluted supplies. The amino acids provide a good cross section of the organic chemical groups but do not exhaust the possibilities in this direction, particularly in view of the prodigious molecular weight of the proteins.

Michael J. Taras—"Preliminary Studies on the Chlorine Demand of Specific Chemical Compounds;" *Journal, Am. Water Works Ass'n*, May.

Well Cleaning With Calgon

During the past seven or eight years a procedure has been developed for using Calgon for cleaning wells where the restriction of flow is caused not only by substances deposited from the water but also by clay, silt or various inorganic minerals present in the ground. A solution of 100-200 lb. of Calgon (16 lb. per 100 gal. of water in the well casing), together with 20 lb. of calcium hypochlorite (to kill iron bacteria and other organic growths), is introduced into the well, without removing the pump or other equipment. The chemicals remain in the well for 48 hr., during which the pump is turned on and off at 4-hr. intervals to provide a churning action and force the solution out into the strata. The well is flushed thoroughly to waste before being returned to service. The Calgon is quite harmless to either metal or concrete during the short contact periods employed.

John P. Kleber—"Well Cleaning with Calgon;" *Journal, Am. Water Works Ass'n*, May.

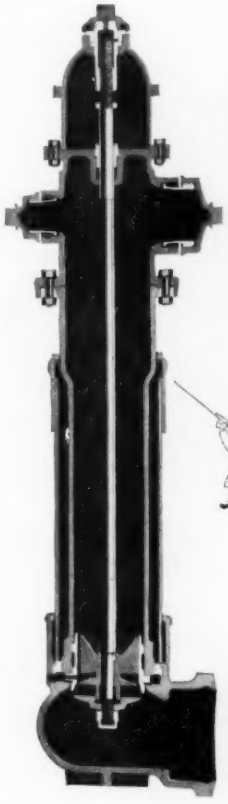
Fluoridation With Sodium Fluosilicate

When Sheboygan, Wis., began to fluoridate its public water supply it paid $8.49 per 100 lb. for 90% sodium fluoride. The price has now risen to $11.14 and they have investigated the use of sodium fluosilicate (also called sodium silicofluoride) instead. The cost would be but 25% as great. Test of it on a plant scale showed that it dissolves as rapidly as NaF and more completely; its feeding characteristics are in every way comparable; it reacts in every way in an identical manner. Prof. M. Starr Nichols reported that "the fluoridation program for the partial prevention of dental caries will not be jeopardized in the least manner by the use of sodium fluosilicate in place of sodium fluoride."

Jerome C. Zufeldt — "Sodium Fluosilicate for Fluoridation;" *Water & Sewage Works*, June.

Backfilling Of Trenches

Two general procedures for backfilling trenches in roadways are: 1—tamping dry or moist soil placed in relatively shallow layers; 2—use of water. Water is used for puddling —pushing the soil into a flooded trench; ponding—filling with relatively dry, loose soil and then saturating; jetting—filling with dry soil and applying water through a jet pipe pushed to the bottom of the fill at frequent intervals. When water is used, the top of the trench is commonly left open for several weeks to dry out and surfaced temporarily. Which ever method is used, the fill immediately below the base course is commonly compacted by rolling, using either narrow drum rollers or rubber-tired truck wheels. Mechanical tamping of fill costs about three times as much as placing it by water, but the cost may be warranted where the time the roadway is



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closed to use must be as short as possible.

Los Angeles has developed a method of supporting existing pipes or other underground structures that cross the trench. Header boards are placed across the trench about 3 ft. each side of the structure and the space between them is filled with sand at the same time that the rest of the trench is filled with ordinary backfill soil. The header boards are then removed. The sand is then flooded with the aid of jets followed with mechanical vibrators. This special treatment is carried to a point about 18" above the structure, above which point normal procedure is used.

Harmer E. Davis, Fred N. Finn and Max K. Socha—"Trench Backfill Practices;" *Journal, Am. Water Works Ass'n*, May.

Fresh Water From the Sea

Studies made by W. W. Aultman, of the Metropolitan Water Dist. of Southern California, of the possibilities of obtaining fresh water from the sea for supplying the cities of California, led him to conclude that "Within the forseeable future there appears to be little or no possibility that it will be economically feasible to turn to the ocean as the source of domestic, agricultural or industrial water along either coast of the United States." It is possible, but at very high cost. By distillation, water is being produced for Curacao's 45,000 population, and units are now being installed for producing 720,000 gpd on the Persian Gulf. The author estimates that the cost per million gallons, for fuel only, would be $537 by compression distillation; $1070 by 3-effect stills; $2600 by single-effect stills. By a suggested electrolytic process, the cost for power only would be $900. Dimineralization by ion exchange would cost $25,000 for chemicals only. In addition, there would be the cost of the plant and of labor. And the product would have to be pumped from the seashore to the point of use.

"Cost is the Chief Obstacle in Obtaining Fresh Water from the Sea;" *Engineering News-Record*, May 18.

Richmond's New Filters

Richmond, Va., in designing its new filter plant, made some changes from the old plant indicated by experience. The sand was made 0.55 mm effective size instead of 0.43 mm. The troughs are made of concrete instead of steel. Instead of valve position indicators, green and red lights are used to indicate full open and closed positions. Instead of a wash-water tank, the new aerator pumps supply the wash water. The filters are not covered; because of the dampness, the present filter building is very expensive to maintain. The large valves controlling the filters have plain ends connected by flexible couplings, eliminating stresses in the valve bodies. Escaping gaseous chemicals and dust are discharged at high velocity through a chimney.

Marsden C. Smith—"Richmond's Newest Filtration Plant;" *Water & Sewage Works*, June.

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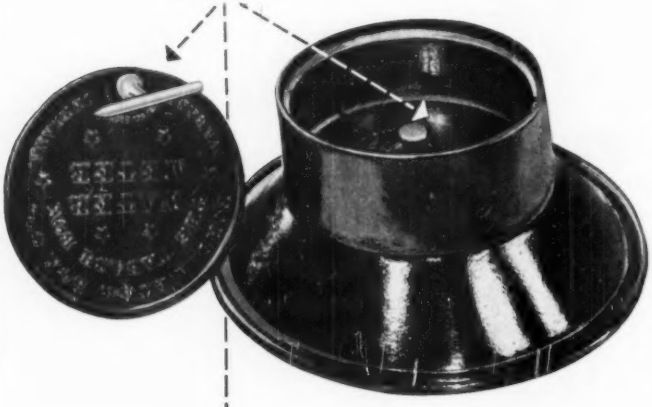

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Diatomite Filters Turn Out Safe, Clean Water. By *Edwin S. Fegg*, Supt. of Water, Cherry Valley, N. Y. May 18, Pp. 35-37.

An Open Reservoir Free of Algae. May 18, Pp. 41-42.

Up-to-Date Tunneling at Neversink. May 11, Pp. 35-37.

Conventional and Upflow Settling Basins. By *H. S. Morgan*, Cons. Engr., and *D. R. Miller*, San. Engr. Great Lakes Naval Center. June 8, Pp. 34-36.

Journal of Public Health

The Newburgh-Kingston Caries Fluorine Study. By *David B. Ast, Sidney B. Finn* and *Isabel McCaffrey*. June, Pp. 716-724.

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L'Ozonation des Eaux d'Alimentation Publique. By *M. Frison*, Ingr. de l'Ecole Polytechnique de Bruxelles. April, Pp. 65-73.

Le Pouvoir Bactericide Compare du Chlore et de l'Ozone. By *J. Ph. Buffle*, Ingr. Chimiste, Service des Eaux de Geneve. April, Pp. 74-82.

La Sterilisation des Eaux par l'Ozone par le Procede Van Der Maele. By *J. Hallopeau*, Ingr. Civil des Mines. May, Pp. 83-85.

Water & Sewage Works

Spartanburg's Water Works. By *H. F. Wiedeman*, Cons. Engr. May, Pp. 183-188.

A Sensitive Turbidimeter. By *D. H. Matheson*, Chemist, Hamilton, Ontario filtration plant. May, Pp. 206-208.

Water Main Sterilization. by *Henry F. Munroe*, Chem. Engr., Proportioneers. May, Pp. 214-218.

Modernization of the Cornell University Filter Plant. By *F. R. Georgia*, Superv. of Water Works, Cornell, Univ. June, Pp. 223-228.

Sodium Fluosilicate for Fluoridation. By *Jerome C. Zufelt*, W. W. Supt., Sheboygan, Wis. June, Pp. 229-231.

Richmond's Newest Filtration Plant. By *Marsden C. Smith*, Chf. Water Engr., Richmond, Va. June, Pp. 233-234.

Water Works Engineering

Metering Policies at Akron, Ohio. By *Wendell R. La Due*, Supt. Bureau of Water & Sewerage. May, Pp. 396-398, 462.

A Century and a Half of Water Works Planning. By *Elbert J. Taylor*, Chf., Bureau of Water, Philadelphia, Pa. May, Pp. 399-401, 465.

Adequacy of Future Supplies Concerns State Officials. Comments of officials of 45 States. May, Pp. 402-403, 485-490.

Air Conditioning and the Public Water Supply Industry. By *W. Victor Weir*, Pres., St. Louis County Water Co. May, Pp. 404, 469.

Willing Water—Healthy or Anemic? *Louis R. Howson*, Cons. Engr. May, Pp. 405-407.

New York Plans Extension of Delaware Water System. By *Victor C. Brownson*, Dep. Chf. Engr., Bd. of Water Supply. May, Pp. 409-411, 471.

Des Moines Expands Supply and Installs Softening Plant. By *Vernon R. Kneer*, Ener. Alvord, Burdick & Howson. May, Pp. 413-415, 482.

A Municipal Plan for A Small City

(Continued from page 37)

chlorination and a baffled contact tank is provided at the end of these tanks. Sludge is withdrawn by a Marlow duplex sludge pump with adjustable stroke, and pumped to a 35-foot diameter sludge digestion tank with a floating cover. One four-compartment open sludge drying bed is provided. It is expected that a duplicate drying bed will be required before the remainder of the plant reaches its designed capacity.

The following units were used as a basis for the design of the plant:

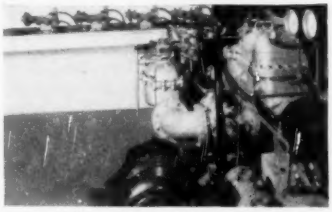
Design population, 7000.
Per Capita flow, 100 gpd.
Tritor screen, 2.5 feet wide.
Two pumps, each with two condition points, 200 gpm at 20 ft. total head and 300 gpm at 17½ total head.
Detention in settling tanks, four hours, (later as Biofilter process 2 hours).
Detention in chlorination and effluent line, ten minutes.
Digester capacity, 2½ cu. ft. per capita.
Sludge drying beds, 3500 sq ft.

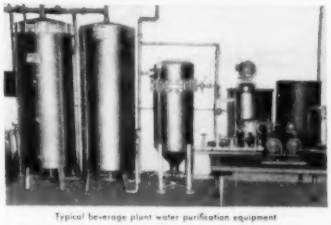
Various details of construction are shown in the pictures on pages 36 and 37.

Plant Site

The site of the sewage treatment plant was near the center of the half mile-wide swamp area but adjoining a railroad fill which gave access for construction. Piling was required to give additional support to the structure in the soft alluvial soil, and in some cases to prevent flotation. Well points were used to dry up the excavation after mate-

Fluoride treatment for prevention of tooth decay


Hypochlorinating flows ranging from 60 to 3600 GPM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rial was hauled in to form a dyke. Well points were also used in the construction of the outfall sewer line in the swamp area.

The fluidity of the soil in this location is indicated by several caveins extending from the pipe to the surface of the ground, resulting from a small leak in the joint of the 24-inch outfall line. This was first brought to the attention of the City Manager, C. D. Pickeriell, by the presence of minnows in the treatment plant. Upon investigation, he found that they had a clear path from the swamp into the line.

The fact that the municipal plan was followed is the most remarkable fact in connection with it. Of course, any plan should be revised periodically, probably every four or five years, in the light of developments, but the previous plan will assist materially in each further step. Dr. Slade A. Smith was Mayor of Whiteville during the construction period, and was Water & Sewer Commissioner during the preparation of the plan. He has been a firm believer in the principle of orderly planning from the beginning.

The cost of the work constructed was as follows:

Water distribution system, $85,000; sewer lines, $200,000; and sewage treatment plant, $130,000.

The water project was constructed by the Ziegler-Cline Construction Company of Fayetteville, North Carolina; the sewer lines by the Nello L. Teer Company, Durham, North Carolina; and the sewage treatment plant by the Lee Construction Corp., Charlotte, North Carolina. Paul G. Nystrom was Resident Engineer.

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THE HIGHWAY and Airport Digest

PUBLIC WORKS DIGESTS

Vibrating Bases in One Layer

In reconstructing the Chattanooga Municipal Airport, one contract included 75,000 cu. yd. of granular subbase and 60,000 cu. yd. of waterbound macadam base. Limestone suitable for this purpose was removed in grading at the airport, and was taken directly from the bin as crushed. It was spread at thicknesses of 5″ to 15″ to a width of 11 ft. at one pass of a large spreader box mounted on a Caterpillar D8 dozer, at rates exceeding 10,000 tons a day. The compacting of one 15″ layer to 10½″ had not been attempted before but was successfully accomplished by use of a "Vibro-Tamper." This is a self-propelled, crawler-mounted unit carrying a tamping mechanism with six 24″ x 16″ vibrating shoes mounted on a horizontal frame. The same spreader and vibrating tamper were used in compacting the macadam base to 8″ thickness in a single layer. Screenings were applied evenly over the coarse aggregate in three applications, the tamper being used after each, followed by a 3-wheel roller. Engineers of the C.A.A. stated that "results indicate the vibrating tamper will reduce both the cost of macadam construction and the length of time required to construct the given thickness of a base course."

C. F. Bond—"New Spreader and Vibrating Tamper Place Stone Subbase and Macadam in Double-Thick Lifts; *Roads and Streets*, May.

Construction on Soft Subsoils

In constructing roads in the peat-bog areas of Holland, one of two methods is commonly used. By one of these, a sand roadbed is built on a fascine mattress into which sand has been thoroughly washed. Where the soil is too soft for this construction, the sand road bed is contained in a reinforced concrete box 7 meters wide and about 1½ meters deep, supported on wooden piles. In order to be able to use shorter piles and yet sufficient end support, the piles were driven with the thick end down. This was done only when, between the ground surface and the layer into which the piles was driven, there were no layers which offered appreciable resistance; in which case the piles were driven small end down.

J. A. Royer—"Aanleg van Wegen in Slappe Terreinen;" *Wegen*, April.

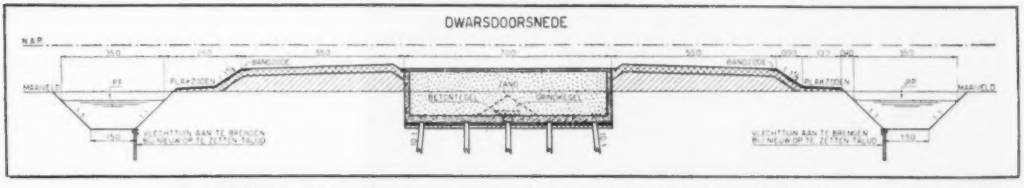
Electric Heating of Oil Storage Tanks

Pierce Co., Washington, stores asphalt and road oil at three distribution centers. A typical plant consists of a 12,000 gal. storage tank and a 3,000 gal. loading tank. Oil is received at 175 to 200° and kept at 200° during periods of continuous use. As needed, it is drawn off into the loading tank, where the temperature is raised to that required for delivery to the job, thus reducing the radiation loss. Investigation indicated that a very substantial saving in cost would be accomplished by using electricity rather than steam for heating the tanks. Electric heaters lend themselves to simple automatic temperature control; heated material at uniform temperature is available at all times; boiler and steam line maintenance costs are eliminated. The heating is accomplished through large tubular resistance heaters, inside which are mounted heater coils supported on ceramic blocks. In 1949 the current for operating two 7,000 gal. main storage tanks and a 2,000 gal. loading tank during five months May-September averaged $80 a month, or 2½ c. per hundred gal. processed.

William A. Stancer—"Oil Storage Tanks Are Electrically Heated; *PUBLIC WORKS*, June.

Repairing Utility Cuts

The methods employed by eleven cities, counties and states in repairing cuts in pavements, or having them repaired by the parties that made them, described in reply to a questionnaire, can be classified under three general heads: immediate permanent repairs; temporary repairs, to be followed by permanent ones after the trench has stopped settling; and not allowing any cuts to be made. Under the third head, Albany Co., New York, does not allow pavement cuts for utility installations on any roads, but requires that pipes and mains be driven beneath the pavement at a depth that will not impair the operation of underdrains, and be enclosed in larger pipes so that they can be repaired or replaced without disturbing the pavement. Spokane Co., Wash., requires that pipe be jacked under the roadway if it is at all possible. In San Joaquin Co., Calif., as much of the line as possible is jacked under the pavement. In backfilling, some require that the backfill earth be kept saturated with water; others require tamping in thin layers. Fulton Co., Ga., backfills with a drag scraper provided with a mechanical tamper which tamps at the same time the ditch



● ***ROAD construction in concrete box on soft subsoil in Holland.*** Courtesy Wegen

is being filled. One county road commissioner believes that at times it is cheaper to build up a slightly settled trench than to insist on expensive refinements in backfilling that are of questionable effectiveness in obtaining ultimate settlement immediately. Most require the new pavement to overlap the cut by 8" or more. Dade Co., Fla., requires that, in replacing cuts in permanent pavements, a reinforced concrete base be installed extending not less than 2 ft. beyond each edge of the trench.

"How Should Utility Cuts Be Repaired?"; *Better Roads*, May.

Parking Habit Data

The B. P. R. studied parking habits in 46 cities ranging in population from 6,000 to more than a million. Some of the general conclusions, the basis for which is given in detail in this article, are abstracted below.

It has been found that the number of available parking spaces and the number of vehicles parked, in proportion to population, decrease rapidly as the size of the city increases —there being seven times as many spaces and thirteen times as many parked vehicles, per 1,000 population, in the small cities as in the large cities. The central business districts of the small cities generate ten times as much traffic, in the peak half-hour, as those of the large cities, when proportioned to population. The percentage of traffic passing through the central business district during the day as a whole is about the same for all cities, but during peak periods 91 percent of the traffic in large cities does not stop to park. In the concentrated core of the central business districts, space-hour demands for parking exceed the supply by ratios ranging from 1.34 in small cities to 4.67 in the large cities.

The proportion of cars parked less than 30 minutes in the largest cities is only half of those parked for the same length of time in the smallest cities. The proportion parked 4 hours and over, however, is three times as large. An influence here is the practice, more common in smaller cities, of using the car to drive home or elsewhere at noon for lunch.

In the small cities almost three-fourth of those parking in the central business districts park within one block of their destination, and less than 50% in the largest cities. Those walking more than 800 ft. is less than 10% in the smaller cities, but as much as 30% in the largest cities. Violations of parking time restrictions were considerably less in zones supplied with parking meters than in those not so supplied.

S. T. Hitchcock and R. H. Burrage——"Some Travel and Parking Habits Observed From Parking Studies;" *Public Roads*, June.

Bicycle Tracks Along Highways

Long-distance cycling (in the Netherlands) will gradually decrease, but that for stretches of about 6 or 7 miles will continue for many years. Cycle-tracks are necessary along all first-class roads. If possible, they should be built at considerable distance from the roadway. The cyclist is interested not only in the smoothness and safety of the track but also in pleasant surroundings, and full attention should be given to the aesthetic surroundings.

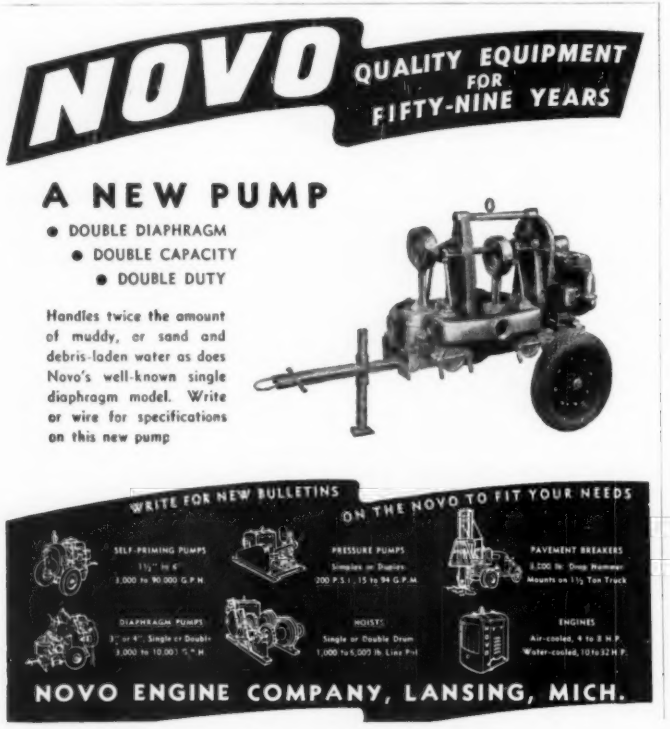
H. B. Bakker — "Rijwielpaden Langs Rijkswegen;" *Wegen*, May.

Streets of Holland cities carry thousands of cyclists, and this greatly complicates regulation of traffic. To improve present conditions the author recommends a special method of left turning in two stages; special cycle paths in the streets; and giving motor traffic the right of way over cyclists.

B. Mees—"Het Rijwielverkeer in de Grote Stad;" *Wegen*, May.

Lane Widths For Truck Turns

The prevalence of large truck-and-trailer and tractor-truck semi-trailer combinations on California highways makes the room required for these vehicles on short radius turns at intersections and connecting ramps an important consideration in geometric design. In order to determine lane widths and shapes for minimum design, the California Div. of Highways drove several large truck combinations in various short radius turns. Apparatus mounted on the vehicles left whitewash marks under the outer front end of the vehicle, the outer front wheel at the hub, the inner rear wheel of the tractor or leading vehicle of combinations, and the inner rear wheel of the trailer. These four traces left on the ground were then recorded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in terms of polar coordinates and plotted on drawings at a scale of 1:60. (A number of these are reproduced in the article). From a study of these, the following conclusions were reached:

1. In making short-radius turns, a tractor-truck-semitrailer combination having legal dimensions describes a track whose width exceeds the track of any other legal vehicle in California.

2. The outside track of a vehicle or combination making a short-radius turn at slow speed is a circular curve throughout nearly all of its length and for practical purposes may be considered to be a circular curve connecting the approach and leaving tangents.

3. The sharpest circular curve which can be described by the outside (front) wheel of one legal vehicle is 45 feet. The practical minimum outside radius for turning lanes is 50 feet.

4. All vehicles and combinations, particularly the 3-S2 combination, when making a circular track with the front wheel, produce a spiral track at the rear wheel.

5. The spiral tracks of the rear wheel for left and right turns of equal outside radii are congruent.

6. The widths vary from a maximum of 20.2 feet for 50-foot radius curves with 180 degrees of central angle, down to 9.9 feet for 200-foot radius curves with central angles of 45 degrees or more. Standard curve widening for curves of radius greater than 200 feet will amply provide for large vehicles and combinations.

J. C. Young—"Truck Turns; Exhaustive Study of Truck-Trailer Paths on Short Radius Turns;" *California Highways and Public Works*, April.

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How to Lay Tar Surface Treatments. By *Geo. E. Martin*, Engr., Barrett Div. June, Pp. 42-43.

Roads and Construction

Aluminum Alloys for Bridges. By *B. J. Fletcher*, Chf. Engr. Aluminum Co. of America. May, Pp. 81-84, 100.

Transitional Grading of Highway Slopes. By *Robert S. Du Bois*, U.S.B.P.R. May, Pp. 85-88, 92.

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Some Travel and Parking Habits Observed from Parking Studies. By *S. T. Hitchcock* and *R. H. Burrage*, Engrs. B. P. W. June, Pp. 25-32.

State Road-User and Personal-Property Taxes on Selected Motor Vehicles, 1950. By *R. W. Meadows* and *S. F. Bielak*, Economists, B.P.R. June, Pp. 33-43.

The Identification of Rock Types. By *D. O. Woolf*, Engr., B.P.R. June, Pp. 44-48.

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Some Aspects of Skidding. By *C. Greville Smith*. May, Pp. 140-143.

Roads and Streets

New Spreader and Vibrating Tamper. By *C. F. Bond*, Contractor. May, Pp. 49-53, 65.

Piles Into Rock Help Stabilize Slide Area in Ohio. By *H. L. Krauser*, Asst. Engr., Ohio Dept. of H'ways. May, Pp. 56-59.

Concrete Widening Job Expedited by Special Equipment. May, Pp. 64-65.

The Case for Intermediate Bituminous Mixes. By *James E. Ward*, Pav. Engr., Barber-Greene Co. May, Pp. 69-71.

Bituminous Flexible Pavements in Wisconsin. By *A. T. Bleck*, Const. Engr., Wisconsin H'way Com'n. May, Pp. 74-78.

Soil Stabilized Base Courses with Tar. By *A. R. Taylor*, Koppers Co. May, Pp. 82-85, 86-89.

Wegen (Netherlands)

Construction of Roads in Soft Ground. By *J. A. Royer*, Chf. Engr., Waterstaat Prov., Holland. April, Pp. 111-115.

Bicycle Paths Along First Class State Roads. By *H. B. Babber*, Chf. Engr. of the Rijkswaterstaat. May, Pp. 137-144.

Bicycle Paths Along Secondary Roads. By *C. Krijn*, Chf. Engr. of North-Holland Waterstaat. May, Pp. 145-148.

Bicycle Paths in Cities. By *B. Mees*. May, Pp. 149-154.

Bicycling in the Country. By *C. A. Kuysten*. May, Pp. 154-157.

Bicycling and Tourism. By *A. G. M. Boost*. May, Pp. 158-159.

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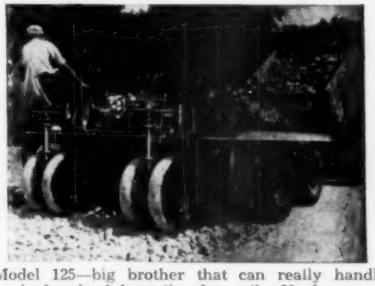

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28,000 HP From Sludge Digester Gas

Digester gas is used for fuel for 18 gas engines of 12,250 hp now in operation at four New York City sewage treatment plants, and 14 additional engines of 16,100 hp are now being installed or are under contract at three plants. Three more plants now under design will use 21 additional engines of 32,400 hp.

Among the installations are: At the Coney Island Plant, there are six engines of 3,600 hp. Three of them are 900-hp Worthington gas engine-generators, and three other 300-hp Worthingtons are in use.

At the Jamaica plant, electric power is provided by three 1,450-hp Worthington engines, giving a total of 4,350 hp. Bowery Bay has two 900-hp Rathbun-Jones gas engine-generators. A 450-hp blower engine, converted to dual fuel at the Tallmans Island plant, was the first installation in this country to be equipped to utilize both digester gas and diesel fuel. At Tallmans Island are 8 Worthington gas engines, totalling 3,500 hp. These drive sewage pumps and blowers.

These data are from the excellent 1949 report of the Department of Public Works of New York City.

City Expenditures Up 16 Per Cent

The 397 American cities of more than 25,000 population spent more than $4,052,000,000 in 1948, as against $3,494,000,000 in 1947, and $3,000,000,000 in 1946. Offsetting increased expenditures, general revenues for these cities reached a new high in 1948 of $3,753,000,000. These, and other financial statistics, including details for individual cities, are from the United States Bureau of the Census. General municipal revenues increased 13.5 per cent in 1948. Property tax yields alone rose 10.3 per cent, or as much as during the entire five-year period from 1942 to 1947. Other tax revenues, however, increased at a much higher rate. Sales and gross receipts taxes, for example, increased 31.3 per cent over 1947. Property taxes in 1948 represented 54.8 per cent of all municipal revenues, a decline from 64.9 per cent in 1942. The increase in expenditures, 16 per cent higher than in 1947, was accounted for largely by increases for schools, public safety, and public welfare. Total municipal debt in 1948 for the 397 cities increased 3.7 per cent to $7,521,000,000, the highest level since 1943.

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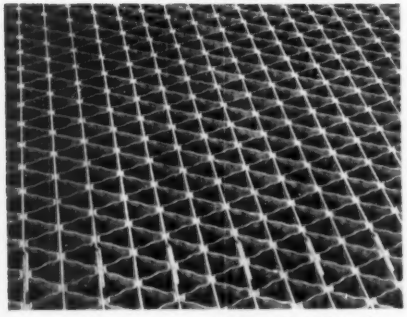

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PUBLIC WORKS DIGESTS

Sampling for Stream Pollution

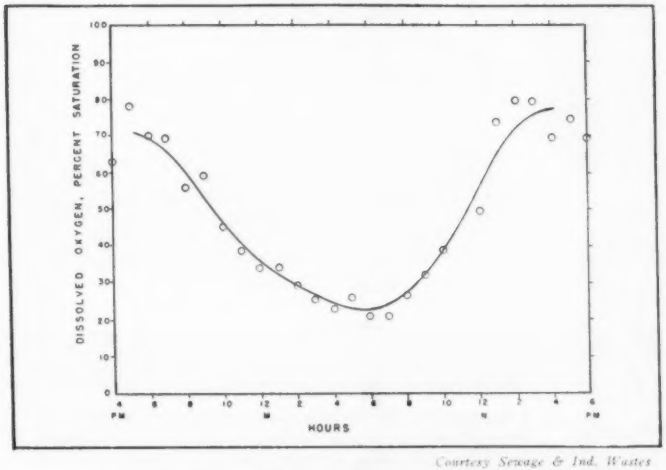
The scientific collection of data for stream analysis may be divided into three major categories: hydrologic factors, sources of pollution, and water-course sampling. Under the first, channel cross-sections are obtained to determine the occupied channel volume associated with a particularly steady stream flow. The Tennessee Valley Authority determines the velocity of flow by a potentiometric method using a salt slug. Use of floats is not considered reliable. For fresh water streams, samples usually are required for B.O.D., D.O., pH. and temperature, and sometimes coliform concentration. The obtaining of representative samples is affected by the daily hydrograph, by relation to sources of pollution and tributaries, by the river's physical characteristics and developments, by discharges of industrial wastes, and by abnormalities in natural purification characteristics. Among the last are immediate demand for dissolved oxygen, sludge deposits, biological adsorption on the stream bed, and algae. The illustration shows the effect of algae on dissolved oxygen content during a 24-hr. cycle of sampling. During daylight hours algae give off oxygen during the night they do not and may utilize oxygen. Therefore a single sample taken during the day would hardly be representative, and samples should be taken every hour or two where algae are involved. Where streams discharge into the ocean there are the additional factors of tides, varying from hour to hour and periodically according to the moon's phase. In general, the statistical approach to sampling affords a maximum of information with a minimum of cost in funds and time.

C. J. Velz—"Sampling for Effective Evaluation of Stream Pollution;" *Sewage and Industrial Wastes;*" May.

Controlling Sewer Insects

Houma, La., believes that it is the first city to initiate a complete sewer insect extermination program. Because of deposits in sewers having very flat grades and the hot climate, odors became a serious problem. Cloroben was applied at manholes at the heads of six laterals at the rate of 60 gal. per 24 hr. Within 24 hr. after the first application, sewage reached the plant odor-free and non-septic. Also it carried a mass of dead cockroaches. The sewage lift stations had always been heavily infested with them, and a 1% solution of Cloroben was sprayed over the entire structure and thoroughly exterminated them. A study of 41 roaches collected in or near sewer manholes showed all of them to be carriers of enteric organisms, some of them definitely pathogens. The City therefore is exterminating roaches. It sprays into each manhole about a quart of a 1% solution under 100 lb. pressure in the form of a fog which penetrates cracks and even extends through the sewers. After all manholes in a given sewer line have been sprayed, a long time elapses before the roaches multiply there again.

Leon Gary—"Controlling Sewer Insects and Sewer Odors;" *PUBLIC WORKS*, June.



Courtesy Sewage & Ind. Wastes

● ***HOW algae influenced D.O. in Wabash River.***

Treatment of Distillery Wastes

Spent distillery mash has a B.O.D. content of 20,000 to 50,000 ppm. Even a 95% reduction gives an effluent containing 1,000 to 2,500 ppm. B.O.D. Most large distilleries dispose of their spent mash by screening, drying and evaporation. A modern dry-house will effectively process the major portion of the organic material in spent mash and give a total BOD reduction of 98.2%. If further treatment is necessary, the remaining waste can be treated by high-rate trickling filters with an average BOD reduction of 93%, giving an over-all reduction of 99.9. The wastes contain considerable copper, and while this does not seem to affect trickling filters adversely, in activated sludge treatment the copper seems to concentrate in the sludge until it reaches a point where it has a toxic effect.

Alex B. Davidson—"Treatment of Distillery Wastes;" *Sewage and Industrial Wastes,*" May.

Incineration vs. Utilization of Sludge

In an "Operators' Forum," this subject was discussed, chiefly by Willem Rudolfs and R. W. Rowen, V. P. of Nichols Engineering and Research Corp. The latter spoke in favor of incineration as being complete and final disposal, unquestionably sanitary, economical, and dependable regardless of weather conditions. Incineration of filtered un-

digested sludge permits great simplification and savings in plant design and operation. At present, about 70% of all types of sludge incineration plants are handling raw sludge filter cake. The same incinerator can burn sewage sludge and garbage, either burning ground garbage at day and sludge at night (as at Ashland, O.), or mixing the two.

Rudolfs replied that, particularly for the smaller plants, sludge utilization may be less costly than destruction. Such utilization includes use of raw sludge as a soil conditioner. Concerning the health danger of this there is a great deal of misapprehension. Experiments made during the last two years with vegetables grown in polluted soil and sprayed with *E. Coli* cultures and raw sewage showed that the organisms die rapidly under normal conditions, and the number found at harvest time on tomatoes so sprayed are not greater than on those grown in unpolluted soil. Fresh feces put on vegetables completely disappeared after 3 days of sunshine. At Springfield, Ill., sludge is taken for use as fertilizer at distances as great as 12 to 15 miles from the plant, and utilization of digester gas has produced power worth $10,000 to $12,000 annually.

"Sludge Disposal vs. Sludge Utilization;" *Sewage and Industrial Wastes*, May.

Alkalinity in Sewage Oxidation

The B.O.D. test leaves much to be desired as a criterion for design and process control.

The biological purification of sewage can be classified according to the mechanisms active in the purification process. These mechanisms and their relative magnitude with respect to each other will determine the chemical and biological character of the substrate.

The alkalinity will measure changes in the chemical character of the liquid and semi-liquid phase with respect to the formation or removal of alkaline or acidic compounds. Oxidation will usually lead to a progressively more acidic medium in a solution containing both carbonaceous and nitrogenous material.

A definite relation exists between alkalinity, ammonia, nitrite, nitrate, oxygen consumed and turbidity, with respect to time in sewage oxidation.

Biological sewage treatment processes may be classified and evaluated and facilities designed in terms of alkalinity and distinctions made as to the type and degree of treatment accomplished.

W. W. Eckenfelder, Jr. and John W. Hood—"Alkalinity Significance in Sewage Oxidation;" *Water & Sewage Works*, May.

Treating Cyanide Wastes

The Norristown plant of American Screw Co. was discharging to the river an average of 4,320 gpd of rinse water, 865 gpd of wash water and 1700 gpd of quench water, all containing cyanide. Ordered by the State Sanitary Water Board to abate or properly treat these wastes, the company, after preliminary studies, recently made provisions to do so. The flow of rinse water has been reduced to a total of 3240 gpd. The quench water was eliminated by substituting gas carbonizing for cyanide hardening. Rinse water is discharged continuously into a holding tank. At the end of each day the pH is adjusted to 9.0 with caustic soda and then chlorinated, using about 4 lb. per day of chlorine. After standing 8-16 hr.

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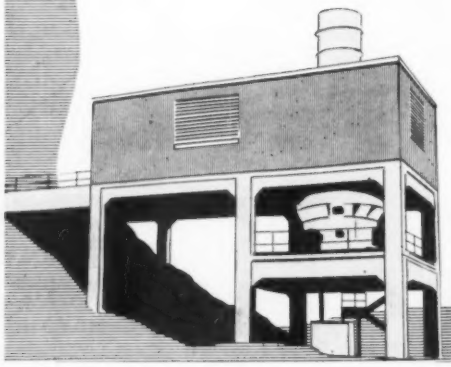

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the clarified liquid is decanted. At about 5-day intervals the accumulated sludge is discharged to drying beds. The effluent, when containing chlorine residual, is free of cyanide. The cost for chemicals and power is approximately $17.07 per month.

R. W. Simpson and K. Thompson —"Chlorine Treatment of Cyanide Wastes:" *Sewage and Industrial Wastes Engineering*, June.

Fluoridation At Newburgh, N. Y.

After three years of application of fluorine to the water supply of Newburgh, a preliminary report presented to the Dental Health Section of the Am. Public Health Ass'n concludes as follows:

"1. The DMF (decayed, missing or filled)) rate for permanent teeth shows a consistent downward trend in Newburgh from 21.0 to 14.8 per 100 permanent teeth. This indicates a saving of 6.5 permanent teeth per 100 in Newburgh as compared with a rate of 21.3 per 100 in Kingston at the last examination. This represents a saving of 30 per cent.

"2. Among first molars, which account for the major part of the caries problem in children, after three years of fluoride experience, Newburgh's rate was 48.0 DMF per 100 first molars, while Kingston's was 58.7, or a difference of 10.7 DMF per 100 first molars. This represents a saving of 18 per cent in DMF first molars.

"3. The greatest benefits are noted in the younger age groups.

"4. The differences between Newburgh and Kingston as represented in these data suggest the possibility of benefits from exposure to fluoridated water subsequent to enamel calcification and subsequent to eruption of the first molars.

"5. We cannot entirely rule out the possibility of variation in the interpretations of the examiners. The fact that more than one examiner was used might alter the differences between Newburgh and Kingston to some extent. However, the size of the differences in the DMF rates of the two cities is such that it is unlikely that an examiner bias could vitiate them.

"6. These data are preliminary and it will be necessary to continue collecting data for the proposed duration of the study, that is, through 1954 to 1956, to obtain additional information concerning the caries prophylactic value of fluorine."

David B. Ast, Sidney B. Finn and Isabel McCaffrey—"The Newburgh-Kingston Caries Fluorine Study:" *American Journal of Public Health*, June.

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Controlling Sewer Insects and Sewer Odors. By *Leon Gary*, Mayor of Houma, La. June, Pp. 48, 52.

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Sampling for Effective Evaluation of Stream Pollution. By *C. J. Velz*, Prof. of Pub. Health Sanitation, Univ. of Michigan. May, Pp. 666-684.

Disposal of Sewage Into Tidal Waters. By *Richard G. Tyler*, Prof. of San. Eng., Univ. of Washington. May, Pp. 685-698.

Sludge Disposal vs. Sludge Utilization. 1949 Operators' Forum, Federation of Sewage Works Associations. May, Pp. 700-703.

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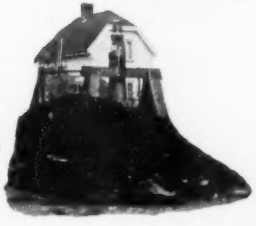

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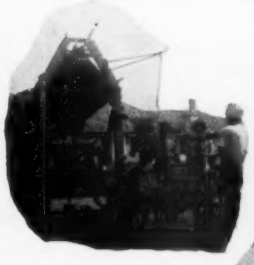

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Sewage Treatment Plant Equipment. By *Frank L. Flood*, Cons. Engr. May, Pp. 201-205.

Unique Flotation Unit for Industrial Waste Treatment. By *F. S. Gibbs*. June, Pp. 241-245.

The Role of Ammonia Nitrogen in Sewage Treatment. By *W. W. Eckenfelder, Jr.* and *John W. Hood*, Chemist and Supt., Sewage Treat. Wks., Ridgewood, N. J. June, Pp. 246-250.

Sewage Treatment Plant Equipment: Grit Chambers. By *Frank L. Flood*, Cons. Engr. June, Pp. 255-258.

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GEOLOGICAL SURVEYS AID IN HIGHWAY DESIGN AND LOCATION

J. L. STUCKEY

This is a portion of a paper by Mr. Stuckey at the Geology Symposium, held in Richmond, Va.

GEOLOGY can and does furnish detailed information as to the origin, nature and occurrence of the materials at the surface of the earth. Highways are founded on and built of these materials. As a result geology furnishes information of value in highway construction.

Modern highways are in general located to serve the greatest need. This does not always permit selection of the best route either geologically or topographically. It is customary to carry out a topographic survey to determine grades, curves and fills even if a good topographic map on a scale of one inch to the mile is available. A detailed geological survey should be carried out at the same time even though a good geological map on a scale of one inch to the mile is available. A geological map contains information on the geology of an area comparable to the topographic information on a topographic map of the same area, provided both are on the same scale.

Detailed geological mapping furnishes information on the relations of underlying structure to topography. It also indicates whether hard or soft rock underlies ridges, whether suitable materials are available for fills, the stability of sloping ground, the availability of materials for construction and the nature of the foundations on which the road bed is to be placed.

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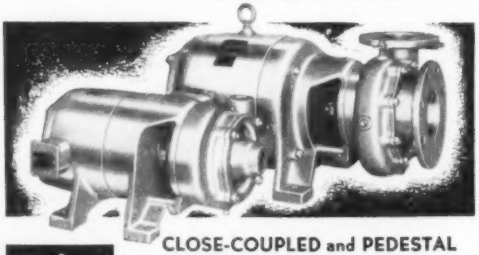

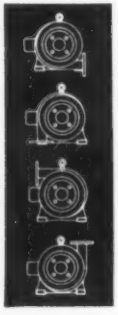

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stated that between 1921 and 1931 the State of North Carolina received $1.20 worth of roads for every dollar it spent. This was due to a lack of proper information on the part of the contractors relative to the cost of grades, cuts, fills and foundations—the sort of information good geological surveys help to secure. Many of the contractors failed and the Bonding Companies finished the contracts. Near Greensboro, N. C., a contractor spent five times as much as he estimated it would cost to grade a 5-acre tract because he did not realize that a small ridge on the tract was underlain with very hard, silicified rock. At a quarry located in steeply dipping volcanic slate, near Hillsboro, North Carolina, the acid rock along the hanging wall graded, in a horizontal distance of one foot, into a soft clay which had to be benched to a depth of 40 feet before rock solid enough to stand was encountered. This wall rock proved to be a slate formed from andesite which had changed to clay while the acid slate remained relatively fresh.

With the exception of swamps and swampy areas in the Coastal Plain of North Carolina, one of the worst parts of the State in which to build and maintain roads is a zone of sediments of Triassic age which crosses the State approximately parallel to and just west of U. S. Highway 1. This zone contains alternating beds of sandstone, siltstone and clay. The sandstones and siltstones are dense and make a good foundation. The clay beds contain a clay that is heavy and tough and has a high porosity and low density. One piece of road across this zone where clay is abundant has been paved four times in recent years and has recently been patched at many places. Another road in the same zone was laid out and graded about three years ago. It was surfaced in the summer of 1948 and was being patched before the end of 1949. Every place where failure had occurred could have been spotted by a careful geological survey of the route while it was being graded.

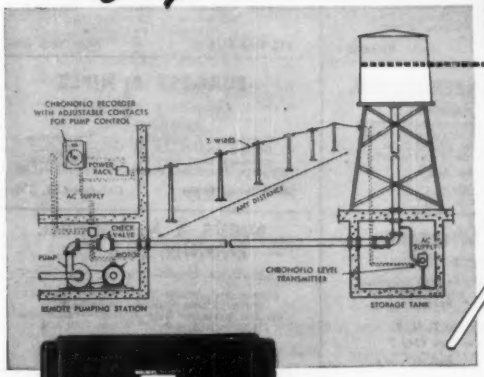
Successful soil sampling for the Soils Mechanics Laboratory must be based on the geology of the material to be sampled. Something must be known of the uniformity and regularity of the soil strata. In the Albemarle Sound region of North Carolina, in one area heavy clay soils 2 or 3 ft. thick often overlie sands, while in a nearby area the reverse is true.. In the case of the second road mentioned above, sampling at distances of 300 feet along the route might either have hit or missed most of the bad spots.

Firm consolidated materials, low in porosity and well drained usually make a good road bed. The occurrence of such materials is related to the geology of the area and can be best determined by a careful geological survey.

All the major mining companies now realize the importance of geology in locating, developing and mining minerals. Engineers open the mines, drive the drifts, and remove the ore. But where the mine is located, which way the drift goes and the sampling which determine these all important decisions are based on the best geological information available. Engineers have built and will continue to build the roads. But roads cannot be built to last as they should unless proper consideration is given to geology and geological surveys.

Roads are founded on geological materials and built of geological materials. When the engineer has done his very best construction job the road is no better than the foundation on which it is laid and the materials of which it is built.

Keep it on the **LEVEL**



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Small Water Supplies — Sources —

(*Continued from page* 39)

installations. Screens should be provided, generally of about ¼ in. mesh. These should be removable for cleaning. In the simplest structures a head wall with guides for sliding the screen out for cleaning will be sufficient; or a crib can be used, weighted with rock. Screens should be corrosion-resistant, of wire or of perforated metal. Openings in screens, and the size of the screen should be such that velocities through them do not exceed 1 or 2 fps and may be lower. A mesh of ⅛ to ⅜ inch is most common in the powered self-cleaning screens.

Reservoirs

Watershed protection has already been discussed. It is even more essential to provide full protection for distributing reservoirs which feed directly into the mains without further treatment of the water. Such reservoirs should be covered, not only to reduce the chances of pollution, but to prevent the growth of algae. Covered elevated tanks are generally preferable for the small community unless exceptionally advantageous terrain features exist.

In small communities, the necessity for fire protection usually fixes the size of elevated storage within or near the built-up area. No definite information can be given in regard to impounding reservoirs. In small communities, a natural lake is often used. The cost of a large dam usually places its construction out of reach. Too much lake area in relation to the watershed may result in excessive evaporation losses. A reservoir lacking capacity may result in excessive drawdown, with algae growths, and the necessity for restricting water use during a dry summer.

The Supply Conduit

Because the cost of providing additional capacity is very high, and modern pipe materials last indefinitely, the supply conduit from the source of supply to the community should be amply large. Careful attention should be paid to the hydraulic gradient. Considerable loss of capacity may result if the line is carried up or over a hill to serve the people living there; it is better to deliver the maximum water to the center of the community and then distribute it to the various areas by feeder lines. High points in

the line should be avoided or equipped with automatic air relief valves. In computing the need for water, future population increases should be given full consideration; and the carrying capacity of the pipe 30 to 40 years in the future should be used as the basis for hydraulic computations.

Changing a Filter to High Rate

(*Continued from page* 43)

structed to draw from the secondary settling tank and a 250 gpm pump was installed in this to discharge to the dosing tank. For these force lines, the 8-inch and 10-inch cast iron pipe salvaged elsewhere was used.

The secondary clarifier was located in such wet and swampy ground that it could not be dewatered without the practical certainty that it would be displaced by hydrostatic pressure. It likewise appeared risky to attempt to level it. Consequently a new lip was constructed, a new level weir installed, the effluent channel leveled, and the discharge modified accordingly. An effluent launder was installed to facilitate recirculation drawoff.

Office Building Changes

The original construction of the office and operating building placed a hand-cleaned bar screen and grit chamber almost in the center of the open floor space, leaving no room for office space in which the operator could make or keep adequate records. The screen was removed, the sewer extended through under the building, the grit chamber filled with concrete, and a new floor laid. A new screen and grit chamber were installed in an extension constructed to the office building. This permitted converting the original building into a suitable office for the operator and installing a shower bath and a clothes and locker room. The chlorinator was also removed from the old portion of the building and installed in a separate space in the extension.

Because it was absolutely necessary to have a high-quality effluent to avoid further damage suits, provision was made for the installation, following secondary settling tank, of a Hardinge rapid sand filter, if this should be necessary. The total appropriation for the work was $40,000. After the plant was put into operation, results were so satisfactory that it was considered unnecessary to install the Hardinge filter at

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this time. Consequently, the total cost of the work amounted to only $25,000. However, all necessary connections are available so that, if increased loadings require it in the future, the Hardinge filter can be installed.

Following completion of the work in the summer of 1949, a composite sample (7 am to 3 pm) was taken on Sept. 20. Relatively few summer guests remained and the flow, including laundry wastes, did not exceed 0.3 mgd. The secondary recirculation pump was not in operation. Raw sewage BOD was 160 ppm; filter influent was 58 ppm; filter effluent was 10 ppm; and final effluent 11 ppm. Even during the worst storms, all flow passes through the plant without difficulty.

Woodridge is fortunate in having an excellent plant operator, Jack Blinder, who is also superintendent of the water system. He operates the plant alone and maintains it in an efficient condition.

Priority Rating for Repairing Streets

A system for rating streets to determine their priority for improvement has been developed by the city engineer's office of Toledo, Ohio. Among the factors assigned and their weights are: Where the condition of the pavement is critical, a weight of 35 points is given; where the pavement has a probable life of three years, the weight is 25 points. Where peak period traffic volumes exceed existing lane capacity, 10 points weight is allotted. For volume of traffic per 24 hours, a weight of 2 points for each 1,000 vehicles is given. Thus a pavement surface that is in critical condition, on a street carrying 17,000 vehicles per 24 hours, with overloaded traffic lanes, would have a rating of 35 plus 10 plus 34 points, or 79 points. C. L. Piper is city engineer of Toledo.

PUBLIC WORKS Equipment News

For Medium Dirt-Moving Needs

Here is a scraper that has 3.6 cu. yds. struck capacity and 4.5 yds. heaped. It is designed to operate

Caterpillar Small Scraper

with the Caterpillar D4 tractor. It will work in close quarters, and has good operator visibility, with ample turning clearance. Wheelbase is less than 14 ft. and non-stop turning requires 19 ft. width. Controls are hydraulic; shipping weight is 7,360 pounds. It has a 47" apron opening, a maximum depth of cut of 6.87 ins. and a maximum depth of spread of 11 ins. Ask for data on the No. 40 Scraper from Caterpillar Tractor Co., Peoria, Ill., or use the coupon.

Use coupon on page 79; circle No. 7-1.

Recording Turbidimeter for Controlling Water Treatment

This new photoelectric instrument automatically measures and records the amount of suspended particles in a liquid. It operates on the principle that turbidity of a liquid varies in direct proportion to the ratio of scattered light to transmitted light through the liquid. Color in the water does not affect it. Operation is on 115-volt circuit. Recording is on either a strip or a circular chart, and may be remote from the primary element. Write General Electric Co., Schenectady 5, N. Y., for GEC-571 or use the coupon.

Use coupon on page 79; circle No. 7-2.

Recording Turbidimeter

New Federal Light and Medium Motor Trucks

A new series of light and medium duty motor trucks has been announced by Federal. These contain many improvements, including a

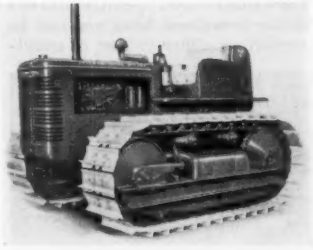
Accessibility of Federal

wider and safer cab, better driver vision, swing-lift fenders to increase accessibility and short turning radius. There are 10 models in the new line, with gross vehicle weights ranging up to 21,500 pounds. Wheelcases are from 126 ins. up. Full information from Federal Motor Truck Co., Detroit 9, Mich., or by using the coupon.

Use coupon on page 79; circle No. 7-3.

More Powerful Medium Crawler Tractor

The IHC TD-9 diesel crawler tractor has been redesigned so that it now produces a drawbar horsepower of 40.5; and a flywheel hp of 51.5. Maximum drawbar pull in first gear is 11,400 lbs. This greater engine power results from several improvements, including a higher



International TD-9 Tractor

compression ratio. Form A-351-NN, with complete specifications, can be obtained from International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., or by using the coupon.

Use coupon on page 79; circle No. 7-4.

Huber Diesel Motor Grader

The Huber heavy-duty diesel motor grader has hydro-mechanical control, a shipping weight to 25,000 pounds (without scarifier) and an overall length of more than 25 ft. Both International or Hercules engines are available for power. Full description is available in Bulletin G-139, which can be obtained by writing Huber Mfg. Co., Marion, Ohio, or by using the coupon.

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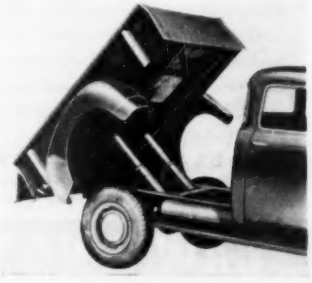
Pick-Up to Dump Truck Conversion Unit

A special conversion unit converts ½-ton, ¾-ton and 1-ton pickup trucks to efficient dump trucks. This compact unit is shipped all ready



Dump Truck Conversion

for easy installation. It reduces greatly the time needed for unloading pickup trucks, since control of the entire process is by a single hydraulic lever. Full information from Hercules Steel Products Corp., Galion, Ohio, or by using the coupon.

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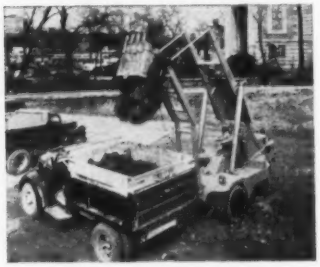
Shovel and Loader for High Dumping

This small shovel operates with hydraulic crowd and hoist and can be supplied on either rubber or crawl-



Dempster High Lift Loader

ers. It has an unusually high lift; at extreme height, the lowest part of the dumping bucket is 13½ ft. from the ground. It has a crowd reach of 10½ ft., and it will dig through an 18-ft. bank. This is Type H, Model 100 Dempster-Diggster, and data about it can be obtained from Dempster Bros., Inc., Knoxville, Tenn., or by using the coupon.

Use coupon on page 79; circle No. 7-7.

Digger-Shovel Works from Truck

This is a low-cost, trailer-type digger that attaches to or detaches from the power take-off of a truck or tractor in one minute. Hourly capacity is 15 to 30 cu. yds. It will dig to a depth of more than 9 ft., and will load 14 ft. high. Swing is 180°. Control is hydraulic. Bucket widths are 14 to 24 ins., and are of three types for various kinds of work. Called the "Hopto," full details are available from Badger Machine Co., Winona, Minn., or by using the coupon.

Digger-Shovel and Truck

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Crushed Rock or Gravel Produced Economically

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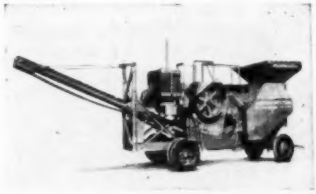

A-W No. 61 Crushing and Screening Plant

ly. It is especially suited for town and county highway maintenance. It is light in weight and easily moved. Ask for information on the "61" from Austin-Western Co., Aurora, Ill., or use the coupon.

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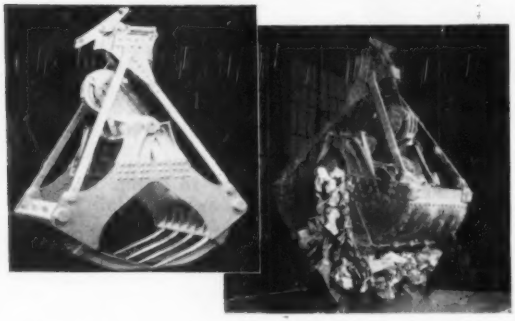

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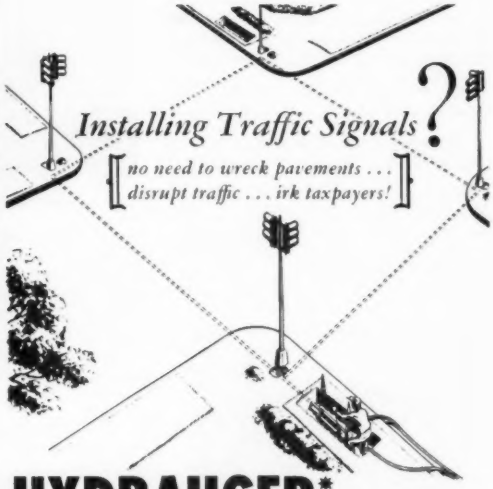

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*Reg. U. S. Pat. Off.

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681 Market Street
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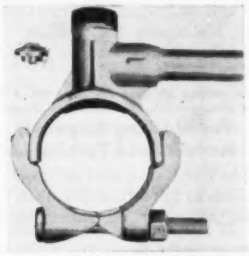
When you need special information—consult READERS' SERVICE DEPT. on pages 79-83.

Service Saddle and Street Tee

This fitting combines service saddle and street tee in one unit and eliminates threads, a principal cause



Skinner Service Saddle

of leaks and branch line failure. Installation time savings are substantial, and stock-binning is reduced. At present, it is made in three pipe sizes—2", 3" and 4" for ¾-inch, 1-inch or 1¼-inch. Special bulletin from M. B. Skinner Co., South Bend, Ind., or by using the coupon.

Use coupon on page 79; circle No. 7-10.

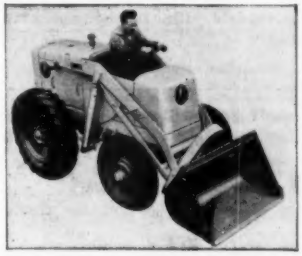
Pump Protection Unit

A new control prevents damage to a pump caused by running without discharging water. The Protectrol automatically stops the pump under such conditions and keeps it from starting until manually reset. It is effective in case of mechanical failure of the pump or line, lowering of the water table, or any other similar cause. An audible and visual alarm is furnished. Full information from Automatic Control Co., St. Paul 4, Minn., or by using the coupon.

Use coupon on page 79; circle No. 7-11.

A Versatile ½-Yd. Unit

According to the manufacturer this unit will dig, load trucks, grade, level, backfill, spread and transport, as well as handle and rehandle bulk materials. It will lift, lower, push and haul. Much other information on this unit is available from the manufacturer, Frank G. Hough Co., 867 Sunnyside Ave., Libertyville, Ill., or by using the coupon.



Hough HE Loader

Use coupon on page 79; circle No. 7-12.

Automatic Timer Controls Screens and Pumps

Reducing footwork and the risk of human error is the job of this automatic timer. It controls and times the operation of screens and

Pump and Screen Control

TENNESSEE CORPORATION

Ferri-Floc

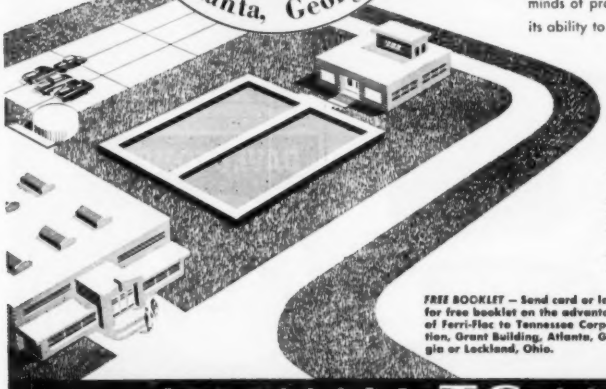
FERRIC SULPHATE

Atlanta, Georgia

Results Count!

- MORE ECONOMICAL
- EASIER TO HANDLE
- SUPERIOR RESULTS

The use of Ferri-Floc in water supplies has several advantages over other coagulants now in use. Economy of operation is a great factor in the minds of prospective users, but, once used Ferri-Floc immediately shows its ability to produce a higher quality of water at a lower cost.



ADVANTAGES OF FERRI-FLOC

1. Coagulation is effective over a much wider pH range than with alum. Color flocs may be formed in the very acid range, where alum may not be employed. On the other hand, true hydrated ferric oxide flocs may be formed at pH 9-10, or even higher for the removal of turbidity and manganese.
2. The time required for floc formation, conditioning, and settling is in many cases considerably shorter than that required for other coagulants.
3. Filter runs have been markedly increased in several cases.
4. Manganese is successfully removed at pH values above 9.
5. Effluents may be produced which are exceedingly low in both iron and aluminum.
6. Hydrogen sulfide is removed, and taste and odor improved.
7. Ferric floc does not seem to stick to sand grains to form mud balls, and is subject to less "breaking through" on the filters.

FREE BOOKLET — Send card or letter for free booklet on the advantages of Ferri-Floc to Tennessee Corporation, Grant Building, Atlanta, Georgia or Lockland, Ohio.

TENNESSEE CORPORATION

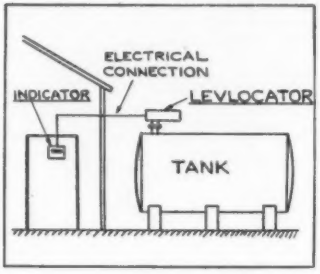
Atlanta, Georgia — Lockland, Ohio

pumps. It will start them when desired, control them during operation and stop them at any predetermined time; or when a set water surface has been reached. Any number of units can be operated for any desired periods of time. One person at a single point can control the operation of equipment at several remote points. Write for information to Midwest Automatic Control Co., 510 Third St., Des Moines, Ia., or use the coupon.

Use coupon on page 79; circle No. 7-13.

The Levelocator

This is an instrument for determining precisely the level of liquid in a tank or other storage. Readings are to 1/100 inch; remote reading



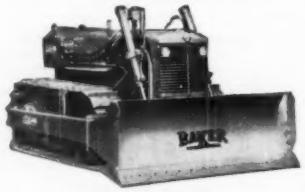
Levelocator

is possible. There are two types—manometer and direct. Both work by means of an electrical or electronic finder. There are two interesting bulletins available—101 and 102. To get them write Asch Equipment Co., 98-11 Queens Blvd., Forest Hills, N. Y., or use the coupon.

Use coupon on page 79; circle No. 7-14.

New Baker Bulldozers

A complete new line of bulldozers and gradebuilders for Allis-Chalmers HD-5 tractors is available. These are hydraulic control, through twin hydraulic cylinders. Mounting is close to the radiator to maintain tractor balance and stability and utilize the full power of the tractor. Conversion from bulldozer to angling gradebuilder is possible with small equipment change. Full



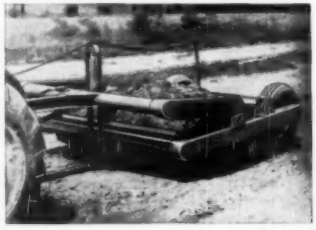
Baker Bulldozer

information from Baker Mfg. Co., Springfield, Ill., or by using the coupon.

Use coupon on page 79; circle No. 7-15.

Small Earth Mover for Highway and Other Work

This 1-yd. (struck capacity) earth mover can be worked with any wheel type or crawler tractor



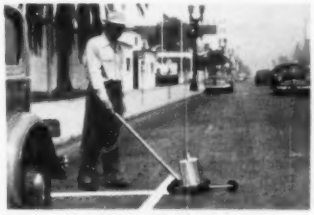
Gledhill Scraper

big enough to handle two 14-inch bottom plows. It will cut smooth and will dump and spread accurately. Cutting depth as desired up to 6 ins.; maximum spreading depth 12 ins. Controls are completely hydraulic. An excellent unit for the many jobs in county and city street and highway construction and maintenance. Write Gledhill Road Machinery Co., Galion, Ohio, for full information, or use the coupon.

Use coupon on page 79; circle No. 7-16.

For Marking Runways, Crosswalks and Parking Lots

This hand operated marker will paint up to 1,500 ft. of 3⅜-inch wide stripe per hour on short lines. It



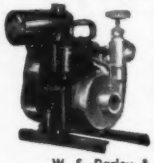
Hand-Operated Marker

lays down a heavy ribbon of paint, using a rubber spreading device. It is designed to get in close to automobiles, curbs and stock piles, and for "touch-up" work of all kinds. Rate of travel governs thickness of paint applied. Uses a quick-drying lacquer. Full information on this handy marker from Mark-A-Zone, 3667 Tracy St., Los Angeles 39, Calif., or by using the coupon.

Use coupon on page 79; circle No. 7-17.

DARLEY PORTABLE PUMPS

Powered by Briggs and Stratton gasoline engines. Automatic Primer. Centrifugals, will handle without injury, water with sand, dirt and gravel content.



Model No. 1½AE— Weight 57 lbs. Capacity up to 40 gallons per minute. Pressures up to 75 lbs.
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Model No. 7AE — Weight 150 lbs. Capacity up to 300 gallons per minute. Pressures up to 80 lbs.

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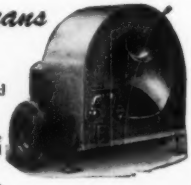

- 3 cu. ft. in 30 seconds
- High output for low investment
- Handles any mix
- Fully portable

ASPHALTIC Mixes cannot be handled like concrete. Ordinary mixers deliver poor mixes and waste asphalt. The Foote Kinetic Mixer is a high quality, dependable unit, capable of the accurate delivery of asphaltic mixes and taking the punishment of continuous service. The new and unusual mixing principle assures complete coating with minimum quantities of asphalt and will give you 8 to 10 more batches out of every barrel of asphalt. You cannot get efficiency from ordinary methods. Savings will soon pay for this mixer. Ask for bulletin K-100.

the FOOTE Kinetic mixer

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ONLY COMPRESSOR WITH PERMANENT PEAK EFFICIENCY LIFETIME VALVES

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KENT, OHIO

Two New Seaman Road Building Machines

The self-propelled Seaman pulvimixer will handle any kind of a stabilization job—bituminous, soil-cement, macadam, calcium chloride, lime or clay-gravel—at speeds of 100 to 300 ft. per minute. The self-propelled travel plant carries a pump, spray bar and tachometer for accurate application of bitumen or water immediately ahead of the mixing rotor. Both of these pieces of road-building equipment are described in a booklet which can be obtained by writing Seaman Motors, Inc., 305 No. 25th St., Dept. I, Milwaukee, Wisc., or by using the coupon.

Use coupon on page 79; circle No. 7-18.

30-ft. Portable Air Compressors

For trenching, light-weight digging, breaking, tamping and inflation of large tires, Worthington makes two-stage air cooled compressors of 30 cf capacity, with maximum operating pressure of 150 pounds. These are hand truck and trailer mounted, and operated by air-cooled gasoline engine. Weights are 630 to 785 pounds. Handy also for sand blasting, paint spraying, etc. Full data from Worthington Pump & Machinery Corp., Harrison, N. J., or by using the coupon.

Use coupon on page 79; circle No. 7-19.

Sewage Treatment Plant Operators Needed

The city of Los Angeles is now completing the Hyperion activated sludge sewage treatment plant and is seeking personnel to operate this plant, which will be one of the largest in the world. Interested engineers and operators should forward a digest of their education and experience to the Civil Service Commission, Room 5, City Hall, Los Angeles 12, Calif. After examination and evaluation of these digests, examinations will be announced. These may be held in various parts of the country.

PERSONAL NEWS

Charles M. Upham, formerly engineer-director of the American Road Builders' Association, has opened a consulting engineering office in Washington, D. C. Temporarily his office will be in 102 Willard Hotel; Nov. 1, he will move to the Cafritz Bldg., 1625 Eye St., N. W.

George H. Buck, of Buck, Seifert & Jost, consulting engineers of New York City, has been elected president and director of the Hackensack Water Co. Mr. Buck will continue as senior member of his firm.

John B. Harrison has been appointed executive officer of the Regional Water Pollution Control Board for the San Francisco Bay Region, with headquarters at 364 14th St., Oakland, Calif. Jack Harrison was a Major in the Sanitary Corps and performed outstanding work in the Los Angeles Port of Embarkation operations.

Arthur T. Clark, secretary of the Water and Sewage Works Mfrs. Ass'n., died on May 24. During the nine years that Mr. Clark held this position, he was instrumental in raising the standards of convention exhibits and in improving water and sewerage conventions.

Henry H. Kranz, City Engineer of Cincinnati, and President of the Municipal Division of American Road Builders' Assn. died suddenly on June 10. A registered professional engineer in Ohio, Mr. Kranz had served the City of Cincinnati for twenty-four years.

FOR LOW COST ROAD REPAIRS

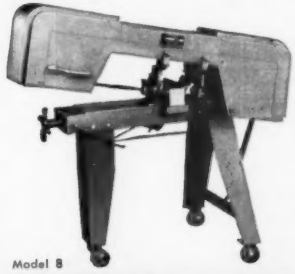
The Littleford 84-HD Kettle is the fastest, safest, most efficient unit ever designed for the repair of Roads, Streets, Highways, Runways and Parking Areas.

This Kettle has a patented heating system that gives efficient, low cost operation. The 84-HD with either a Hand Spray or Motor Spray Attachment makes road repairs a simple matter. Two men can operate and spray with a Hand Spray Attachment while the Motor Spray Attachment makes the 84-HD a one man kettle. Made in sizes from 75 to 325 gallons.

LB LITTLEFORD

LITTLEFORD BROS., INC.
452 E. Pearl St., Cincinnati 2, Ohio

The "Junior" Model B Johnson Band Saw comes either with or without casters. Using casters, it can be easily pushed from one section of the shop to another, or two men can carry it. It has three-point supported rigidity—accuracy and speed. It will reduce your metal cut-off work. Capacity: 5" rounds, 10" flats.



Model B

JOHNSON
METAL CUT-OFF
BAND SAW

is also furnished in the larger Model J; Capacity 10" rounds, 18" flats. Sturdy and fast. Cuts square and true.

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You can begin locating leaks immediately. You only dig one hole when you use the "Universal" Leak Detector.

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625 Hanna Building, Cleveland 15, Ohio

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KONIK metal has the strength and tough endurance that culvert use demands. It resists rust and corrosion and the constant pressures culverts have to take. KONIK is an open hearth metal that contains copper, nickel, chromium and other elements—and, it is heavily zinc-coated for still greater protection. For culverts that will last longer get KONIK metal. Ask your culvert distributor or write Continental at Kokomo, Indiana.

ASK TO SEE THE KONIK CULVERT METAL WARRANTY

Your Continental Culvert sheet distributor will be glad to show you the Certified Analysis that assures longer culvert life with KONIK metal.

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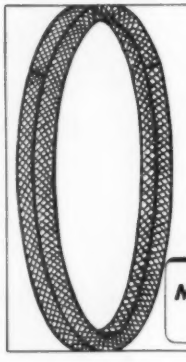

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NEW LISTINGS

How to Select the Proper Sno-Plow for Your Truck

21. Fully illustrated 24-page catalog on Frink Sno-Plows includes valuable tables on proper plow and leveling wing selection for mounting on all size trucks. Detailed discussions cover special features which result in performance plus economy. Use coupon for copy. Frink Sno-Plows, Inc., Clayton, 1000 Islands, N. Y.

What Should You Look For In a Pump Motor?

41. Twelve important features which include scientific cooling, regulated lubrication, weatherproofing and interchangeability are described and illustrated in full color in the handsome bulletin on the new Streamway U. S. Motor. Check these features to be sure that you are getting pump power designed for service under the toughest conditions. Check the coupon. U. S. Electrical Motors, Inc., Los Angeles 54, Calif.

Choose Grating For Footwalk Safety

49. Open steel grating of both riveted and welded types add safety to all public works structures. The new Klemp catalog shows applications for bridges, power plants, water and sewage plants and many others. Load tables and specs are included. Write Klemp Company, 6001 S. Melvina Ave., Chicago 38, Ill., or use handy coupon.

Handy Catalog Covers Complete Tractor and Grader Line

70. A new 20-page booklet in a handy pocket size features Allis-Chalmers complete industrial tractor line. The importance of wise buying and fitting the equipment to the job is emphasized. Don't miss your copy. Use coupon today. Allis-Chalmers Mfg. Co., Tractor Div., Box 512, Milwaukee, Wis.

How Enduring Paint Lowers Maintenance Costs

74. A new folder entitled "Protecting Gas Holders" outlines the advantages of silica graphite paint in reducing yearly maintenance costs to gas holders. The economic data is equally applicable to the problem of protecting all types of metal structures. Get Bulletin V-56 from Joseph Dixon Crucible Co., Paint Sales Div., Jersey City 3, N. J.

Data on Combined Aeration, Coagulation and Sedimentation

138. The Process Oxidator which combines aeration, coagulation and sedimentation for water and sewage treatment in a single circular tank is described with diagrams and flow sheets in a new 12-page bulletin. Full engineering data and results of plant operation are included. Check coupon for information on this treatment process. Process Engineers, Inc., 6381 Hollywood Blvd., Los Angeles 28, Calif.

How Short Coupled Turbine Pumps Are Used

125. Ease of installation and dependable service make short coupled vertical turbine pumps particularly desirable for many municipal pumping jobs. Bulletin SCP-50 shows application of Layne pumps for lake and river intakes, fire pumps, drainage, pipe line boosters and many other uses. Check coupon for your copy of this valuable booklet. Layne & Bowler, Inc., Memphis 8, Tenn.

Design Details on Flash Mixers and Flocculators

128. Descriptions of Dorr equipment for the basic steps of flash mixing and flocculation, sizes and design data for transverse flow flocculator, installation plans and sections are all included in Bulletin 6971. Write The Dorr Company, Barry Pl., Stamford, Conn., or use handy coupon.

Chlorine Treatment of Municipal Water

136. In a new bulletin Fischer & Porter summarizes present day chlorine processes and equipment, and provides a yardstick for checking present facilities or future requirements. Flow diagrams and illustrations show advantages of process instrumentation in municipal water treatment. Get Bulletin A-1A-4 from Fischer & Porter Co., 1000 County Line Road, Hatboro, Pa.

"15 Steps to Better Concrete Construction"

107. In an illustrated booklet written especially for engineers and architects the Sika Chemical Corp. lists detailed information and specifications on compounds engineered to answer specific problems of concrete and masonry construction. A valuable bulletin for all interested in better concrete. Check coupon or write Sika Chemical Corp., 40-49 Gregory Ave., Passaic, N. J.

Latest Data on Grease Interception

118. For full data on grease interceptors for industrial, packing house, commercial or domestic service get the Josam Manual "B". Selection chart and formula, flow control data, and typical installation diagrams are all included. Josam Mfg. Co., Dept. PW, 1302 Ontario St., Cleveland 13, Ohio.

How to Build and Operate A Sanitary Fill

146. A complete discussion of many types of sanitary fill construction, together with cost data from communities of all sizes, is offered by the Drott Mfg. Corp. Get this valuable presentation on the Drott Bullclam and International Crawler tractor combination, specially designed for all phases of sanitary fill work, by checking the handy coupon, or write Drott Mfg. Corp., Milwaukee 8, Wis.

Street Sweeping . . . More Miles At Less Cost

104. The powerful Elgin 81 with a 3-yd. hopper, 7½-ft. sweeping width is featured in a new folder just published. Full data on all the developments for easier, quicker, quieter operation are included. Copies available from the Elgin Corp., 501 Fifth Ave., New York 17, N. Y.

Simple Method for Hardness Testing

139. New Literature describes the "S. and B." method for determining water hardness with a simple titration and positive-endpoint indicator. Precise results are claimed for all hardness ranges. Use coupon for your copy of form 28x7446. Allis-Chalmers Mfg. Co., 1189 70th St., Milwaukee, Wisc.

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Shovel or Load With The Dempster Diggster

45. Automotive Hydra-Shovel digs 15 ft. above, 15 in. below grade, features independent hydraulic hoist and crowd action. Capacities 1 cu. yd. for digging solid earth, 1¼, 1½ and 2 cu. yd. for loading all types material. Get information from Dempster Brothers, Inc., 949 Dempster Bldg., Knoxville 17, Tenn.

Federals Feature Lower Costs On Hauling Jobs

39. Heavy duty hauling ability for construction jobs and dependable power for maintenance work are built into all Federal trucks described in colorful new folder. A broader range of trucks covers models from medium to highest tonnage capacities. Full specifications from Federal Motor Truck Co., Dept. PW, Detroit 9, Mich.

Speed Your Work With These Powerful Motor Graders

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speed in road, airport, dam and housing construction work are fully described in a folder illustrated with many action pictures. Issued by Galion Iron Works & Mfg. Co., Galion, Ohio.

Data and Pictures of Complete Line of New Ford Trucks

58. Check this number on the coupon for colorful circular showing new Ford Trucks for every hauling need, available in great variety of standard, factory-built chassis and body combinations. Be sure to check these trucks on your job. Truck and Fleet Sales Dept., Ford Motor Co., Dearborn, Mich.

How to Pump Debris Laden Water

63. Bulletin 167-D describes the Novo lift-and-force diaphragm pumps which feature compact design, easily opened cleanout plate and triple-life diaphragms. 3" and 4" sizes handle water laden with large amounts of debris and abrasives, and containing large percentages of air. Copies from Novo Engine Co., Lansing 5, Mich.

52-Page Data-Packed Bulletin On Contractors' Pumps

95. Tables for pump size determination on every excavation job, pipe friction loss, attitude effects and lots of other valuable data are included in this comprehensive booklet illustrating the many Jaeger "sure-prime" pump applications. Get your copy (catalog P45) by checking our coupon or writing the Jaeger Machine Co., Dept. PW, Columbus 16, Ohio.

Special Pumps to Fit Any Dewatering Job

101. Centrifugal Pumps. Long lasting, self-priming, non-clogging pumps for quickly dewatering trenches and similar construction jobs. Ask for Bulletin 7-LW-13. Gorman-Rupp Co., 320 No. Bowman St., Mansfield, Ohio.

Folders Tell "Inside" Story Of Crawler Tractors

108. Performance-boosting and cost-cutting features of International crawler tractors are graphically presented in two new folders issued by International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. Titles are "How Long is Your Tractor's Life Line" and "Is Your Horsepower Getting to the Track?".

New 15,000 GPH Pump Weighs Only 57 Pounds With Engine

150. Together, the 5-HP engine and 15,000 GPH (250 GPM) pump just introduced by McCulloch weigh only 57 pounds. Pump has 28-ft. suction lift; 3-in. outlet and inlet; automatic governor. Get complete information in Bulletin 4960 from McCulloch Motors Corp., Dept. PW, Los Angeles 45, Calif.

Power Requirements On the Construction Job

191. The power requirements of excavators, compressors, electric equipment, pumps, ditchers, rollers and movable forms are discussed in a new illustrated publication by Caterpillar Tractor Co. Specifications on a complete line of Caterpillar Diesel Engines are included. Use coupon to get a copy, or write Dept. PW, Caterpillar Tractor Co., Peoria 8, Ill.

Helpful "How To Use" Section Aids Roller Selection

195. In addition to specification and illustrations of roller operation, the new Buffalo-Springfield catalog features a special section to help in the selection of the right roller model for the job. Be sure you get top results from your roller selection by checking this helpful material. Use the coupon for a copy. Buffalo-Springfield Roller Co., Springfield, Ohio.

POWER AND LIGHT

Using Sewage Sludge Gas For Power Generation

27. A new 8-page illustrated bulletin, No. 4811, describes Superior Dual Fuel Diesel engine operation and illustrates the simplicity of controls with fuel conversion by either push buttons or hand lever. Copies are available from Superior Engine Div., Dept. PW, The National Supply Co., Toledo, Ohio.

Air Cooled Engines for Hundreds of Applications

137. Tested under severest conditions of long, hard use, these engines have earned world wide recognition as the "right" power for hundreds of applications. Get latest bulletin from Dept. PW, Briggs and Stratton Corp., Milwaukee 1, Wisc.

Low Cost Power From Dual Fuel Engines

154. Operating on the Diesel cycle, burning either oil or gas, the Worthington Supercharged Dual Fuel Diesels give high economies by running on the cheapest fuel available. Get complete data from Worthington Pump & Machinery Corp., Dept. PW, Harrison, N. J.

REFUSE COLLECTION AND DISPOSAL

New Unit Cleans Catch Basins in a Jiffy

34. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit. Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass.

Efficient Material Handling to Reduce Incineration Costs

130. Blaw-Knox Buckets specially designed for refuse and garbage handling are described in 22-page Bulletin 2247. Illustrations show progress of material through a modern municipal incinerator plant. Dimensions and incinerator bucket specifications are included. Blaw-Knox Div., 2124 Farmers Bank Bldg., Pittsburgh 22, Pa.

How You Can Improve Your City's Street Cleaning

162. The Austin-Western Model 40 sweeper features three wheel design, front wheel steer, for easy maneuvering; rear broom to sweep dirt and refuse directly into 2-yd. hop-

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Investigate This Plan For Garbage Elimination

164. A new presentation, written especially for municipal officials, offers a modern solution for the garbage disposal problem. Be sure you have this up-to-date information on the elimination of city garbage collection by the use of Hotpoint Disposall units. Check the coupon now. Hotpoint Disposall Department, 5600 West Taylor St., Chicago 44, Ill.

WATER WORKS

What You Should Know About Hypochlorination

20. This really helpful booklet tells you a lot about hypochlorination of water for small and medium sized supplies, swimming pools and main sterilization, and fully describes the application of manual and automatic "Chem-O-Feeders" for constant or proportional feeding of chemicals. Send for Bulletin SAN-8 issued by Proportioneers, Inc., Box 1342, Providence 1, R. I.

Quick Way to Locate Leaks and Pipe

57. Leak Locators. Again available to waterworks superintendents, the Globe line of leak locators, dipping needles and pipe finders. Several leaflets describing the original Geophone leak locator, Little Wonder pipe phone, and the Magnetic Dipping Needle. Globe Phone Mfg. Corp., Dept. P., Reading, Mass.

Improved Clarification with Carter Circular Collectors

61. Latest 16-page bulletin on water and sewage equipment, No. 4906, gives complete data and specifications on Carter's three different types of clarifiers. A valuable working guide for every sanitary engineer. Ralph B. Carter Co., Dept. PW, 188 Atlantic Ave., Hackensack, N. J.

Helpful Data on Hydrants

64. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M. & H. Valve & Fittings Co., Dept. P.W., Anniston, Ala.

Cast Iron Pipe and Fittings For Every Need

65. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe, Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Dept. PW, Burlington, N. J.

Now You Can Actually See Your Chlorine Residual

79. By using the Wallace & Tiernan residual chlorine recorder you can get better chlorination control because you actually see at all times the residual being carried. The 24-hour charts provide a valuable record and check on operating irregularities. More data on what the recorder is and what it does are covered in Bulletin M-20-S. Wallace & Tiernan, Dept. PW, Newark 1, N. J.

How to Estimate Quantity Of Joint Compound Needed

87. The uses of Tegul-Mineralead for bell and spigot pipe and G-K Sewer joint compound are described in bulletins issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

Keep That Trench Pumped Really Dry!

93. To find out how well a Homelite Carryable Pump handles large volume, seepage, mud, write today for illustrated bulletin L-503 containing data of great value to all pump users. Write Dept. PW, Homelite Corp., 2110 Riverdale Ave., Port Chester, N. Y.

Pressure Pipe That Retains Capacity

106. Several bulletins describing the construction of pressure pipe, list of installations, carrying capacity tests, making service connections under pressure; and detail descriptions of several installations. Lock Joint Pipe Co., Box 269, East Orange, N. J.

How to Keep Trenching Jobs on Schedule

24. The easy maneuverability of the tough, compact Cleveland Model 95 "Baby Digger" makes it well suited for the difficult job of trenching past the many obstacles of city and suburban work. Multiple digging and crawler speeds handle all soil types and trench widths up to 24". Get Bulletin S-52 from Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

Data on Modern, High-Rate Water Treatment Plant

40. This handsome 28-page bulletin gives a comprehensive yet understandably written story of the development of the Accelator, and explains its principles, advantages, design considerations, operation and applications. Helpful flow diagrams and specifications. For a copy use the coupon or write Infilco Inc., 325 W. 25th Place, Chicago 16, Ill. Ask for Bulletin 1825.

Specs for Gate Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

Handy Catalog Describes Small Hydrants, Drinking Fountains

115. This 32-page catalog describes ¾" to 2" hydrants. Also street washers, drinking fountains and other water service devices. The Murdock Mfg. & Supply Co., 426 Plum Street, Cincinnati 2, Ohio.

How to Make Metal Cutting Faster, More Efficient

123. Pipe up to 10", structural shapes and heavy solid stock can be cut with speed, ease and perfect accuracy with the Johnson metal cut-off band saw. If you are not familiar with this modern machine get free data now by using handy coupon, or write Johnson Mfg. Corp., Albion, Mich.

The Modern Way to Filter Swimming Pool Water

129. That's the title of a bulletin full of facts about Bowsers' new diatomite filter to produce clear, sparkling, clean water at low cost. Occupies small space, doesn't waste water. Gives sizes to use, performance charts, etc. Write Bowser, Inc., Dept. PW, 1395 Creighton Ave., Ft. Wayne, Ind.

Find Buried Pipe The Goldak Way

131. Finding buried pipe is easy with the new Featherweight Goldak Pipe Locator. An easy-to-read illustrated bulletin tells the full story quickly. Address: The Goldak Co., 1544 Glenoaks Blvd., Glendale 1, Calif.

Data on Chlorinizer Now Available

132. Bulletin 840-F2 features the Builders Chlorinizer and shows complete details of apparatus to accurately meter chlorine gas and deliver controlled chlorine-water solution. Positive rate of flow indication, wide metering range. Get your copy of this bulletin from Builders-Providence, Inc., P. O. Box 1342, Providence 1, R. I.

All About Cement-Mortar Lining of Water Mains

133. Here, in a really beautiful booklet, is practically everything you need to know about this method of lining mains in place—the needs, methods, and results that will interest you. Centriline Corp., Dept. PW, 140 Cedar St., New York 6, N. Y.

How Elevated Water Tanks Can Save on Operating Costs

134. Beautiful new booklet on Horton elevated steel water tanks suggests ways to reduce pumping costs, increase capacity of systems, maintain uniform pressure, etc. Illustrates 7 models of welded, ellipsoidal-bottom, elevated steel tanks in full color. Write Chicago Bridge & Iron Co., 2115 McCormick Bldg., Chicago 4, Ill.

How Accurate Boring Speeds Underground Pipe Installations

135. Interesting charts showing earth boring costs, speed and accuracy for holes from

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2½" to 14½" diameter and up to 80 feet long are included in 16-page Catalog No. 8 issued by Hydrauger Corp., 681 Market St., San Francisco 5, Calif. Specifications and general operating instructions are also covered.

Faster Pipe Laying With Precaulked and Threaded Joints

148. McWane 2" cast iron water pipe with threaded joints and precaulked bell and spigot pipe are described in folder WM-47. Additional data on 3" to 12" centrifugally cast pipe and fittings in folder WL-47, both issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala.

Complete Equipment for The Complete Pool

157. Latest equipment for recirculation, filtration, chlorination, softening and pH control are described in Permutit Bulletin No. 2157. Manual and automatic valves explained and many installations diagrammed. Complete specifications given. Permitit Co., 330 West 42nd St., New York 18, N. Y.

Easy Way to Locate Leaks In Underground Pipe

160. Fast and accurate leak detection pays dividends in water savings and avoidance of needless digging. For data on the "Universal" Leak Locator write Leak Detector Co., 625 Hanna Bldg., Cleveland 15, Ohio.

Fabrication with Everdur For Long-Range Economy

169. Corrosion-resistant Everdur alloys are available in all wrought commercial shapes suited for dozens of applications in water and sewage plants. Many examples shown in Publication E-11 issued by The American Brass Co., Waterbury 20, Conn.

Your Property is Worth Good Protection

176. When installing link fence you want protection against rust and corrosion as well as vandalism. Investigate chain link fence made of "Konik" metal described in "Planned Protection" published by Continental Steel Corp., Kokomo, Ind.

What You Should Know About Meter Setting and Testing Equipment

166. Complete details on all equipment and proper methods for meter testing and installation are included in an excellent book published by Ford Meter Box Co., Wabash, Ind. All waterworks men concerned with setting and testing of water meters should have a copy of this book. Write for Catalog No. 50.

Complete Bulletin on Municipal Supplies

178. Everything from leak locators to street signs is listed in the big bulletin on "Municipal Supplies" published by Darley. Hundreds of different items for all city departments are included in this handy booklet. Get a copy for ready references on all municipal supplies from W. S. Darley & Co., 2814 Washington Blvd., Chicago 12, Ill.

Locate Mains and Services Without Digging

186. A 16-page booklet tells how to use the Fisher "M-Scope" to locate buried pipes and valves by electronic means. Proper manipulation also determines depth of cover. Battery operated unit is readily carried by one man. Get data from Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif.

How Your Filter Washing Can Be Improved

188. More thorough sand washing with the elimination of mud balls and cracking with resultant longer filter runs are claimed for the Palmer Filter Bed Agitator, described in bulletins issued by the Palmer Filter Equipment Co., P. O. Box 1655, Erie, Pa.

Installation Guide for Transite Pressure Pipe

192. A convenient, pocket-size book of 115 pages covers the whole job from receiving and handling pipe to pressure and leakage tests of finished lines. Over 100 drawings show important operations, and the text tells both how and why. Copies are available from Johns-Manville, Dept. PW, 22 E. 40th St., New York 16, N. Y.

STREETS AND HIGHWAYS

Latest Maintenance Equipment for Blacktop Roads

52. "Blacktop Road Maintenance and Construction Equipment"—Asphalt and tar kettles, flue type kettles, spray attachments, tool heaters, surface heaters, road brooms and rollers. This is modern and up-to-date equipment for blacktop airport and road construction and maintenance. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati 2, Ohio.

Open Steel Mesh Pavement for Bridges

72. A pavement that is self-cleaning, self-draining, light of weight, strong, durable, fireproof, economical and requires no maintenance, is described in a 24-page catalog by Irving Subway Grating Co., 5053 27th St., Long Island City 1, N. Y.

Just Right for Fast, Small Asphalt Mixes

90. The Foote Kinetic Mixer delivers 3 cu. ft. in 30 seconds. Portable and easily operated. Get Bulletin K-100 from The Foote Co., 1954 State St., Nunda, N. Y.

Reference Manual on Guardrail Design

114. Here is an interesting and informative booklet in which all factors influencing guardrail design are outlined, and safety and economy discussed in detail. Eight pages are devoted to basic design data, with handy tables covering physical properties, tensile and beam strengths, deflection and other data. Write Armco Drainage and Metal Products, Inc., Dept. PW, Middletown, Ohio.

"A Decade of Duraplastic Air-Entraining Cement"

121. This is the title of an illustrated booklet which tells the development of Portland Air-Entraining Cement from its initial use ten years ago to its present acceptance by highway engineers. Get a copy by using coupon or write Atlas Cement Co., Dept. PW, Chrysler Bldg., New York 17, N. Y.

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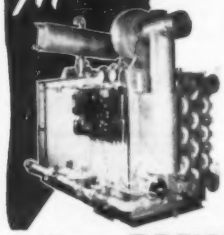

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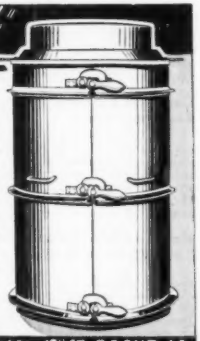

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Heating, Thawing and Melting With Hauck Burner Equipment

142. A newly released 16-page bulletin covers the complete line of Hauck heating and melting equipment. Data covers units for every water, sewer and street department purpose, from "one-man" burners to large size portable kettles. A useful addition to your reference file. Get Bulletin 1068 from Hauck Mfg. Co., 117-127 Tenth St., Brooklyn 15, N. Y.

How to Save Time on Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Heltzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving setups show how to speed up the job and save money. Get your copy from Heltzel Steel Form & Iron Co., Dept., PW, Warren, Ohio.

Road Widening With Concrete, Bituminous Mix or Gravel

149. All types of road building materials are handled quickly and accurately by Apsco Wideners. New illustrated bulletin shows operations on all types of widening strips, gives details on wideners and trench rollers. Issued by All Purpose Spreader Co., Elyria, Ohio.

Versatile Maintainer Has Year 'Round Usefulness

151. A new bulletin shows how the sturdy Huber Maintainer will work for you the year 'round on maintenance jobs, berm leveling, road planing, bull-dozing, snow plowing, brooming, mowing shoulders and as a patch roller. Good ideas on how to do all these jobs in Bulletin No. M-138. Write Huber Manufacturing Co., Dept. PW, Marion, Ohio.

Tractor-Mower Team Speeds Highway and Municipal Mowing

194. The John Deere Model "MI" tractor and "MI-7" mower work as a team to keep highway shoulder and municipal mowing at the economical minimum and performance maximum. Full description of the two units, and complete specifications are in Bulletin A724, available from Deere & Co., Dept. PW, Moline, Ill.

Case Histories of Sidewalk Resurfacing

209. A very interesting brochure dealing with sidewalk resurfacing and waterproofing shows how easily-applied "Plastic Rock" asphaltic concrete results in an attractive, non-skid wearing surface. Use the coupon for full information. United Laboratories, Inc., 16801 Euclid Ave., Cleveland 12, Ohio.

SEWERAGE AND WASTE TREATMENT

Packaged Sewage Treatment— Just Right for Small Places

36. "Packaged" Sewage Treatment Plants specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.

Design Details for Sludge Collectors

42. Booklet No. P.W. 1982 on Link-Belt Circuline Collectors contains sanitary engineering data and design details. Catalog No. 1742 on Straightline Collectors, contains layout drawings, illustration pictures and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia 40, Pa.

A Handbook of Sewer Cleaning Equipment and Methods

46. A new, fully illustrated 40-page booklet shows every sewer cleaning operation with "Flexible" tools. Includes data on the fast and easily operated new Sewe RodeR and full engineers' specifications for power bucket machines. For your copy write Flexible Sewer Rod Equipment Co., 9059 Venice Blvd., Los Angeles 34, Calif.

How You Can Dispose Of Sewage Solids

54. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Dept. PW, Nichols Engineering and Research Corp., 70 Pine St., New York 5, N. Y.

Design of Septic Tanks When Using Home Garbage Grinders

26. The use of a Youngstown Kitchens food waste disposer with a septic tank is thoroughly discussed in a new booklet released by Mullins Mfg. Corp. Tables show tank sizes for new construction, recommendations are made for improvements and better operation of existing systems, and a wealth of other valuable information is provided. For a free copy use coupon or write to Mullins Mfg. Corp., Dept. PW, Warren, Ohio.

Glazed Clay Blocks for Trickling Filter Underdrains

66. Illustrated bulletin describes the Natco Unifilter block of glazed, hard burned clay for underdraining filter beds. Write National Fireproofing Corp., 327 Fifth Ave., Pittsburgh 22, Pa., for free copy.

Recording Meters for Parabolic Flumes

73. Engineering data on parabolic flumes and accurate companion meters for open flow water and sewage metering is given in Simplex bulletin 210. Installation data and calibration included. Write Simplex Valve and Meter Co. Dept. 4, 6750 Upland St., Philadelphia 42, Pa.

Vitrified, Salt Glazed Filter Bed Block

86. An 8-page folder contains instructive design applications and detailed descriptions of Dickey underdrain tile for filter bed bottoms. Diagrams show how air passes up through blocks for filter ventilation. Issued by W. S. Dickey Clay Mfg. Co., 922 Walnut St., Kansas City 6, Mo.

Complete Catalog for Engineers Shows Sewage Plant Equipment

110. A complete, 44-page catalog gives engineering data on Jeffrey equipment for water, sewage and industrial waste treatment plants including screening, screenings grinders-grit collectors and washers, settling tank collectors, feeders, Floctrols, mixers and other mechanical equipment. Use coupon to get Catalog 775-A, Jeffrey Mfg. Co., Columbus 16, Ohio.

How to Improve Coagulation and Sludge Conditioning

111. "Ferri-Floc," description and instructions for use in coagulation, sludge conditioning and treating industrial wastes, fully treated in a 24-page pamphlet. Tennessee Corp., 619-27 Grant Bldg., Atlanta 1, Ga.

Be Sure to Check These Digester Features

117. Floating covers for digesters, their advantages and details of construction, and suggestions for digester operation are contained in a 42-page catalog. Write Pacific Flush-Tank Co., Dept. PW, 4241 Ravenswood Ave., Chicago 13, Ill.

Get This Data for Your Laboratory

119. "Water and Sewage Analysis," a 32-page booklet, describes and illustrates equipment for making convenient and accurate water and sewage analyses, including comparators, aqua testers and turbidimeters. Hellige, Inc., 3718 Northern Blvd., Long Island City 1, N. Y.

Need Low-Cost Air For Sewage Treatment?

122. New 20-page booklet shows operating and construction features of Rotary Positive Blowers engineered to fit your needs. Air for activated sludge, water treatment: constant vacuum for filtering. Bulletin 22-23-B-13 gives details. Roots-Connersville Blower Corp., 504 Poplar Ave., Connersville, Ind.

Conkey Filters for Sewage Sludge Disposal

180. Development of Conkey sludge filters and applications to all types of sewage sludge are described in Bulletin 100. Tables show filter sizes, weights, and give average anticipated results. Write General American Transportation Corp., Process Equip. Div., 10 East 49th St., New York 17, N. Y.

Eight Advantages of Vacuum Sludge Dewatering

189. Efficient sewage treatment requires economical sludge disposal. Eight advantages of vacuum dewatering of sewage sludge are described in a new folder issued by the Eimco Corp., Salt Lake City 8, Utah. Use the coupon for your free copy.

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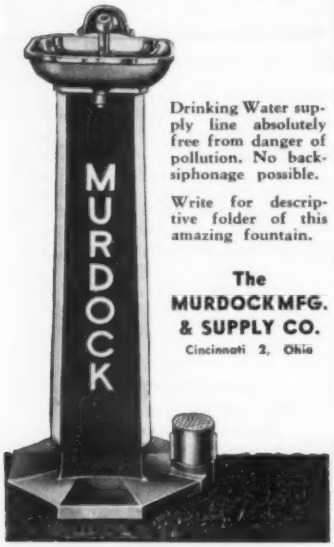
No Pollution

The Finest Outdoor Drinking Fountain in the World



Drinking Water supply line absolutely free from danger of pollution. No backsiphonage possible.

Write for descriptive folder of this amazing fountain.

The MURDOCK MFG. & SUPPLY CO.
Cincinnati 2, Ohio

FOR BETTER
pH Control
and WATER TESTS

there is nothing like

NON-FADING GLASS COLOR STANDARDS

Pocket Comparator No. 605

Permanent reliability of Hellige Glass Color Standards, accuracy of color comparison, simplicity of technique, and compactness of the apparatus are exclusive features of Hellige Comparators.

WRITE FOR BULLETIN No. 602

HELLIGE
INCORPORATED
3718 NORTHERN BLVD. LONG ISLAND CITY 1, N.Y.
HEADQUARTERS FOR COLORIMETRIC APPARATUS

WORTH TELLING . . . By Arthur K. Akers

We welcome the new house organ, "The COURIER," of **Builders Iron Foundry.** We understand that if properly approached any of the boys from Builders, % Proportioneers % or Omega Machine will see that you get it if you are not already doing so.

•

International Harvester Company announces resumption of their nagazine, "INTERNATIONAL TRAIL," for the first time since 1942. It is of primary interest to truck operators but we found it interesting, and we don't even own a truck!

•

Robinson Clay Product Company, Akron 9, Ohio, has available on request a new color movie, "Out of the Earth", showing how they make clay pipe. They also announce a new general office building and warehouse in Jamaica, Long Island, N. Y. superseding their Manhattan offices and Maspeth L. I. warehouse.

•

Marlow Pumps' municipal sales on the West Coast and in the intermountain states will now be under the capable wing of **J. B. Diepenbrock,** district sales representative.

•

Mack Trucks, Inc., has opened three new services to educate the public on transportation issues. Mack Trucking Information Service at 350 Fifth Avenue, New York 1, will be glad to put you on their lists for these new services.

•

Bendix Aviation is standing right at the elbow of Dr. Wallace Howell, New York's official rainmaker, handing him $15,000 worth of Bendix weather recording instruments, as needed. All we know is that New York's water reserves now exceed those of last June.

•

G. W. Fine has been appointed assistant sales manager of **U. S. Stoneware Co.,** plastic coatings division.

•

Federal Motor Truck names **W. H. Franks** factory sales representative in their Atlanta region; **Cecil J. Goodbrake** in St. Louis; and **E. F. Schaefer** in Seattle.

•

D. M. Brendle is new eastern district sales manager for **Huber,** with offices at Ephrata, Pa.

Paul C. Hurley Jr is now manager of **Pennsylvania Salt Manufacturing Company's** newly-created sales promotion department. Under him will be advertising, promotion research, and salesmen-training.

•

On May 19 acting secretary-manager **Dorothy Dimmers** of the **Water and Sewage Works Manufacturers Association** had 32 exhibitors signed up for the New England Water Works convention to be held at Poland Springs, Maine, Sept. 17-20. She admits that a few more can be accommodated if they hurry.

•

At **Fischer and Porter Company,** Hatboro, Pa., **Arthur Patureau** succeeds Sydney Steele as sales promotion manager.

•

Layne-Central, of Memphis, is stepping up its Water Treatment Division activities with the acquisition of **W. N. Patterson,** now teamed up with **L. G. McNamara** to become their second sales engineer in the field.

•

Here's a heap of **Hubers:** 22 of them in all will be shipped to Haifa,

Israel. First jobs for them will be on construction of 11,000 houses, after which they will get busy on roads and streets and airports throughout Israel.

•

After delivering 200 trucks to New York City for ash and rubbish collection, **Autocar Company** sells New York 42 more for sanitation department use. Ultimately at this rate we may get our town cleaned up.

•

We wouldn't want you to miss this one from the KABLEGRAM: A mountaineer on his first visit to the big city was fascinated by the asphalt streets. Scraping his feet on the hard surface, he remarked to his boy: "Well, I can't blame 'em for building a town here. The ground's too durned hard to plow, anyhow"

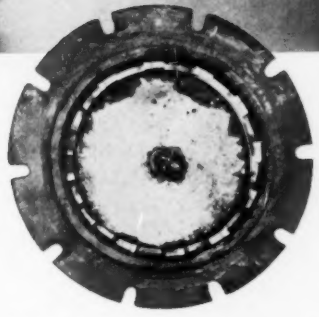
It's easy to tap!

LOCK JOINT
CONCRETE PRESSURE PIPE

Lock Joint Pressure Pipe of any design may be tapped easily and economically for the purpose of establishing either large connections or small service outlets. With the aid of a few simple instructions, any experienced service crew can apply the modern tapping technique which permits the making of connections in concrete pressure pipe while the line continues to operate under pressure.

Although, for many years, taps have been made successfully in concrete pressure pipe, today's efficient equipment and modern methods now make it possible to tap Lock Joint Concrete Pressure Pipe with even greater economy of time, money and effort, and without sacrificing strength.

At your request we would be glad to send you our booklet outlining the simple steps required in making a pressure tap in Lock Joint Concrete Pressure Pipe.



LARGE PHOTO: Tapping a 16" outlet in a 36" pipe at Wayne County, Michigan.

SMALL PHOTO: The pilot drill of the tapping machine withdraws the concrete core, making a clean cut, and leaving no obstruction within the pipe line.

Lock Joint Pipe Company for over forty years has specialized exclusively in the manufacture of reinforced concrete pipe for water supply and transmission mains as well as for sewers, culverts and subaqueous installations.

LOCK JOINT PIPE COMPANY

Est. 1905

P.O. Box 269, East Orange, N. J.

PRESSURE PIPE PLANTS: Wharton, N. J., Turner, Kan., Detroit, Mich.

BRANCH OFFICES: Casper, Wyo. • Cheyenne, Wyo. • Denver, Col. Kansas City, Mo. • Valley Park, Mo. • Chicago, Ill. • Rock Island, Ill. Wichita, Kan. • Kenilworth, N. J. • Hartford, Conn. • Tucumcari, N. Mex. Oklahoma City, Okla. • Tulsa, Okla.

LOCK JOINT
Reinforced Concrete
PRESSURE PIPE

Cincinnati Case History

City of Cincinnati

DEPARTMENT OF WATER WORKS
FILTRATION PLANT
9990 KELLOGG AVENUE
CINCINNATI 26, OHIO

W. R. KELLOGG
CITY MANAGER

C. EBERLING, Supt.
E. B. EVANS
Superintendent of Water Purification

Cincinnati's Experience
With
Break-Point Chlorination

Cincinnati, Ohio started Break-Point Chlorination on February 10, 1949 by pre-chlorinating the raw Ohio River water-the source of its supply.

After one year of this treatment we have accomplished:

1. A great reduction in taste and odor complaints.
2. Entire elimation of presumptive gas forming and Coliform bacteria at the plant.
3. Reduction in the number of filters washed:
   10,287 washed in 1948—5,917 washed in 1949
4. Period of service of filters greatly increased.
5. A larger chloramine residual leaving the plant than we formerly were wont to carry.

At the present time we have not realized any savings in the cost of chemicals. This is primarily due to the type of water we must treat. Since the raw water has a low alkalinity the additional use of chlorine must of necessity call for soda ash treatment and therefore additional cost.

Regardless of the cost we feel that the efforts expended to install and maintain the Break-Point process of chlorination has been unquestionably justified.

Yours very truly,

CINCINNATI WATER WORKS

E. B. Evans
Sup'vr. of Water Purification

From: E. B. Evans

To find out how your plant can obtain all these advantages call your nearest W & T Representative today.

Interior view showing five Wallace & Tiernan Master Chlorinators, Type MAHSV on the left, with their accompanying evaporators on the right.

Exterior view, chlorinator house at the Cincinnati Filtration Plant.

WALLACE & TIERNAN COMPANY, INC.

CHLORINE AND CHEMICAL CONTROL EQUIPMENT
NEWARK 1, NEW JERSEY • REPRESENTED IN PRINCIPAL CITIES